3DROCK+

User Manual

DSTA
Defence Science & Technology Agency

NANYANG TECHNOLOGICAL UNIVERSITY

3DROCK+

User Manual

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3DROCK+

User Manual

by Advance Contech (Singapore) Pte. Ltd.

Table of Contents

Part I About 6

Part II System Requirements 9

Part III Installation 12

Part IV Activation / Licensing 18

Part V GUI quick glance 21

Part VI General Workflow 23

Part VII Common Tasks 26

1 Change View Mode ... 26
2 To make DEM profile distintive ... 28
3 Pan / Zoom / Rotate view ... 29
4 Select / De-select Entity ... 31
5 Show/Hide by Selection ... 34
6 Show/Hide by Type ... 36
7 Rename Entity ... 37
8 Delete Entity ... 38

Part VIII Commands 42

1 Modeling ... 42

Point / Line ... 42
Import PointSet ... 42
Import Polyline ... 45
DEM ... 48
Import VegGis ... 48
Create Base ... 49
From PointSet ... 50
Cut DEM ... 52
Create DOM (Overlay) ... 54
Apply DOM ... 58
Pin ... 59
Create Pin ... 59
Create Overlay ... 60
ContourSet ... 60
Create ContourSet ... 60
Export ContourSet to DXF file ... 63
SectionSet ... 65
Create SectionSet ... 65

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RockMass **67**
Create 67
From PolylineSet 68
From GoCAD 69
Tunnel **71**
Create 71
Import 72
Cavern **73**
Create 73
2 Computation **75**
Analysis **75**
DEM Profile 75
Measure **76**
Distance & Volume 77
Cut & Fill 79
Proximity Analysis 80
Boolean **81**
3D Boolean 81
3 Borehole **83**
Import **83**
Import 83
Borehole **85**
Add/Remove 85
Show Legend 86
Graph **86**
Value-Depth 87
Histogram 89
Filtering records **90**
Change display type **93**
4 Visualize **95**
Navigation **95**
FlyThrough 95
Simulation **96**
Stages 96
5 System **98**
Z scale **98**
Reset **99**
About **99**

Part IX Support & Contact **101**

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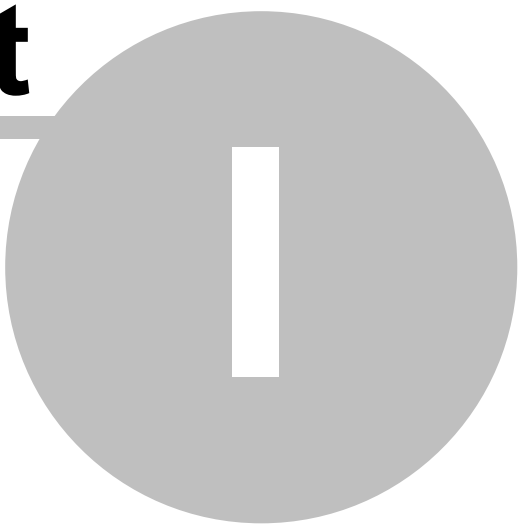
Part



1 About

3D Rock Plus (3DROCK+) is a general purpose three dimensional (3D) Geographical Information System (GIS) developed by Advance Contech (Singpaore) Pte. Ltd. for the joint-research project Underground Technology & Rock and Engineering (UTRE) Phase II of Nanyang Technological University (NTU) and Defence Science Technology Agency (DSTA) Singapore.

This user manual provides information on the operation of 3DROCK+.

Last updated: 2nd April 2014, Singapore

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Part II

2 System Requirements

Basic System Requirements

- Intel i5 CPU @ 2.5G Hz (or better)
- 4 GB DDR3 RAM (or more)
- 7200 rpm harddisk with 250GB capacity (or higher) [Solid State Drive recommended)
- ATI Radeon HD (or NVIDIA Quadro) series graphics card with dedicated 2GB VRAM
- 1024 x 768 resolution with 32-bit color depth (or better)
- Keyboard and 3-button mouse with scroll-wheel
- 32-bit or 64-bit Windows Vista/7/8 operating system with .Net Framework 3.5 SP1 pre-installed

Note: 64-bit operating system recommended.

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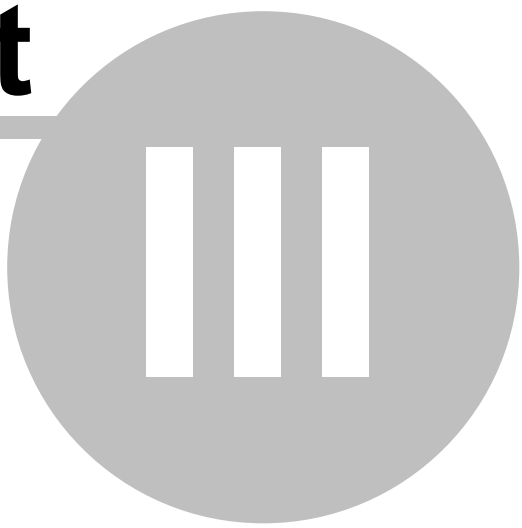
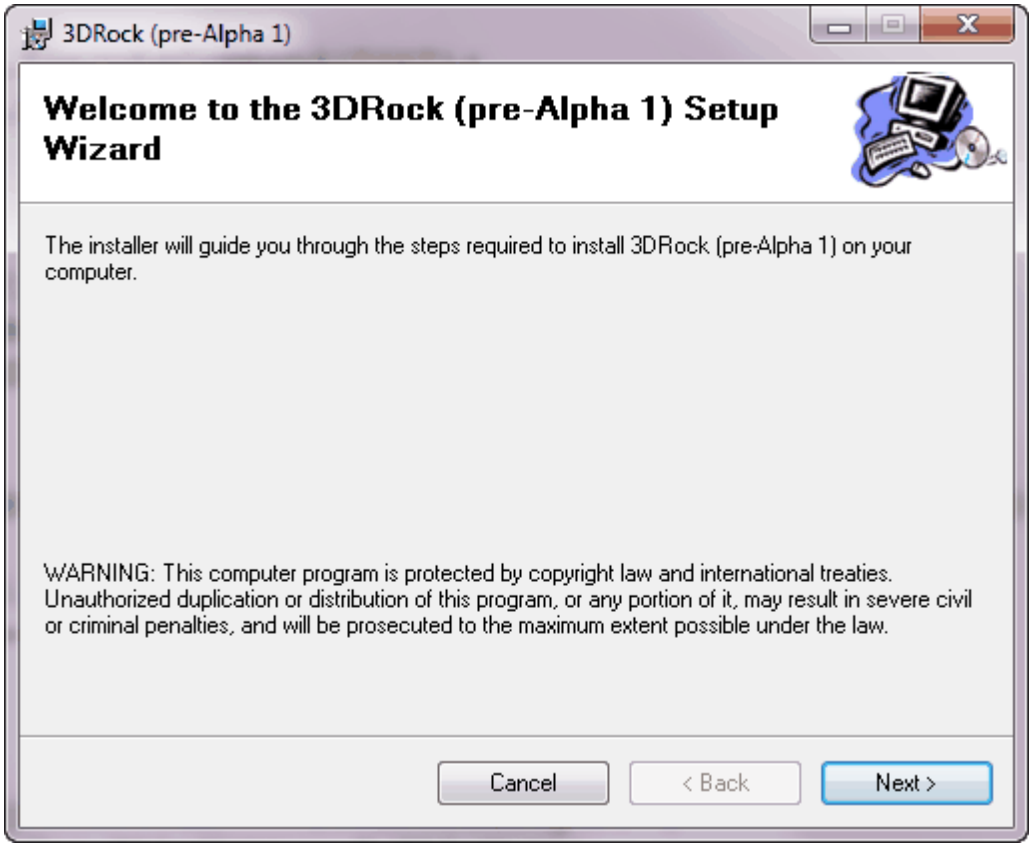
Part



3 Installation

1. Insert Setup CDROM / USB, and run Setup.exe to launch the installer, a welcome screen will show, click [Next >]


3DRock (pre-Alpha 1)
Welcome to the 3DRock (pre-Alpha 1) Setup Wizard
The installer will guide you through the steps required to install 3DRock (pre-Alpha 1) on your computer.
WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
Cancel
< Back
Next >

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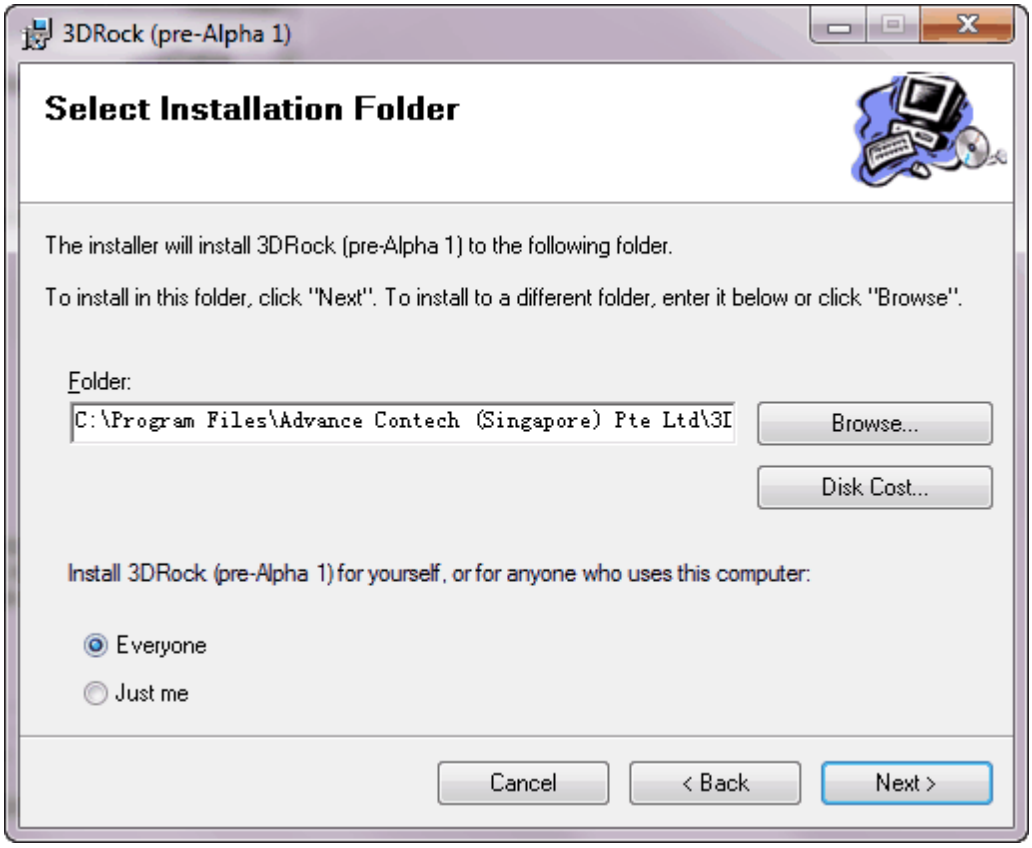
2. Change the default installation path (if necessary), decide if the program will be installed for all user of the computer, click [Next >]


3DRock (pre-Alpha 1)
Select Installation Folder
The installer will install 3DRock (pre-Alpha 1) to the following folder.
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files\Advance Contech (Singapore) Pte Ltd\3I
Browse...
Disk Cost...
Install 3DRock (pre-Alpha 1) for yourself, or for anyone who uses this computer:
Everyone
Just me
Cancel
< Back
Next >

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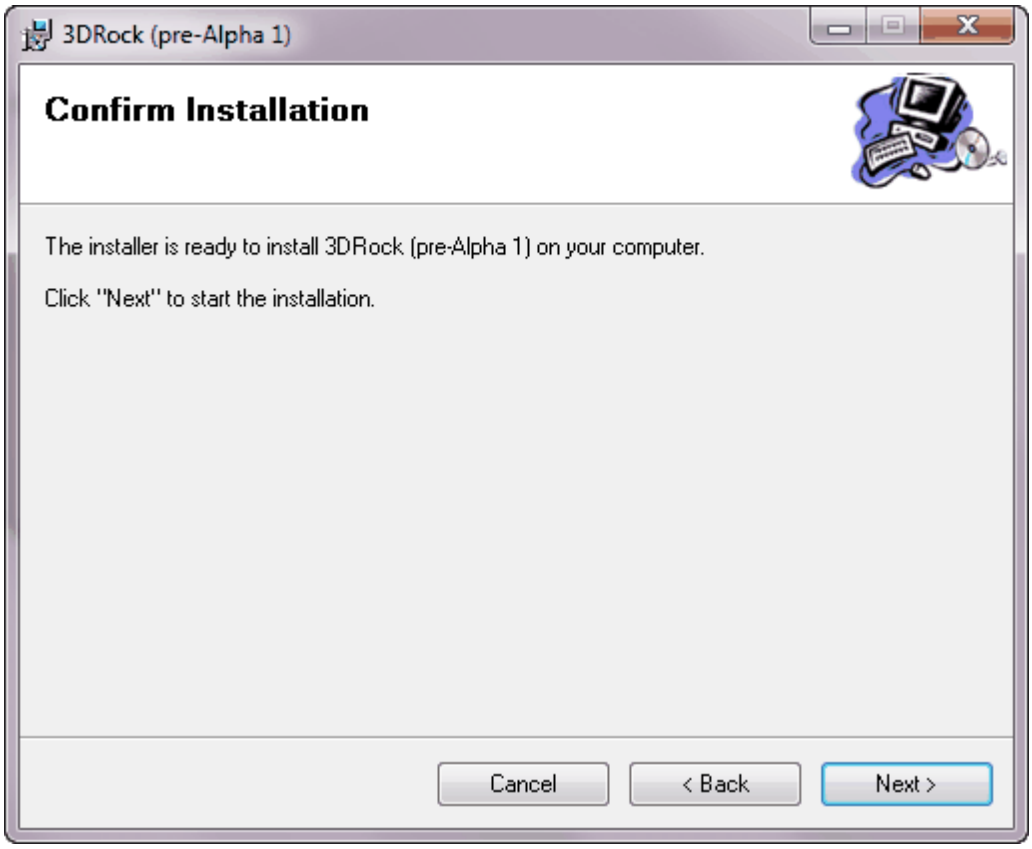
3. Click Next to start the installation


3DRock (pre-Alpha 1)
Confirm Installation
The installer is ready to install 3DRock (pre-Alpha 1) on your computer.
Click "Next" to start the installation.
Cancel
< Back
Next >

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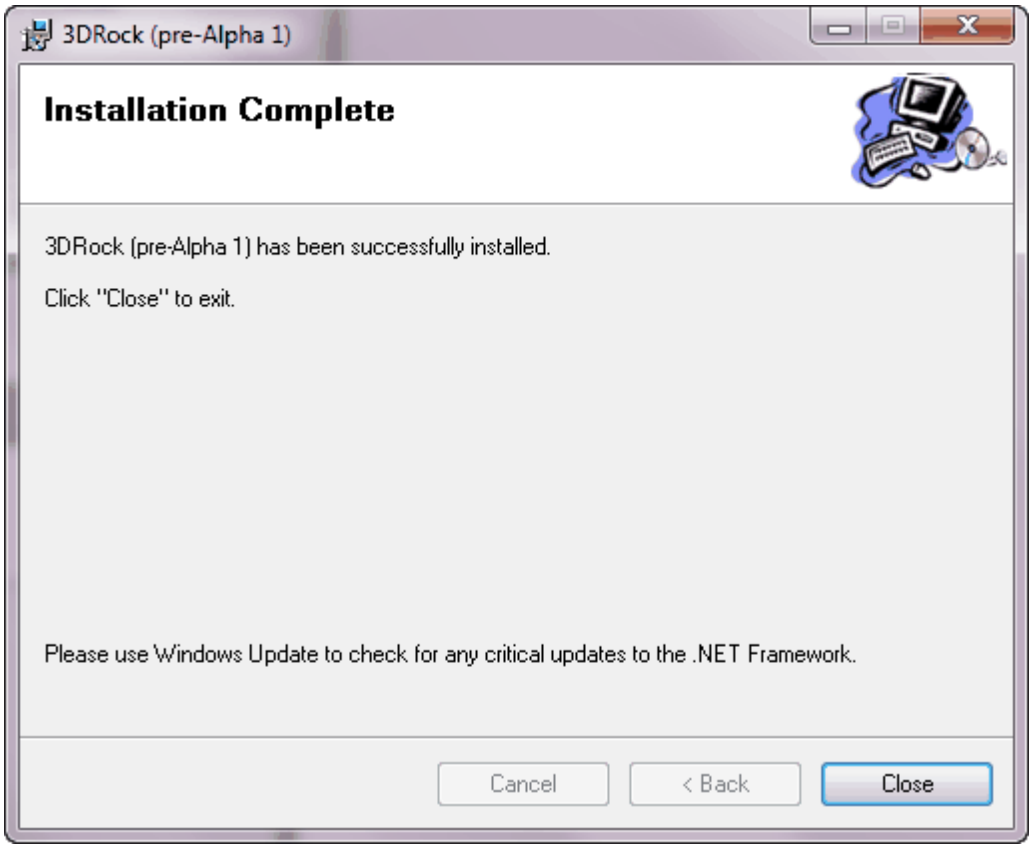
4. Click [Close] after the installation is finished.


3DRock (pre-Alpha 1)
Installation Complete
3DRock (pre-Alpha 1) has been successfully installed.
Click "Close" to exit.
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel
< Back
Close

5. A new icon is added to the Desktop, double click on that to launch the program.

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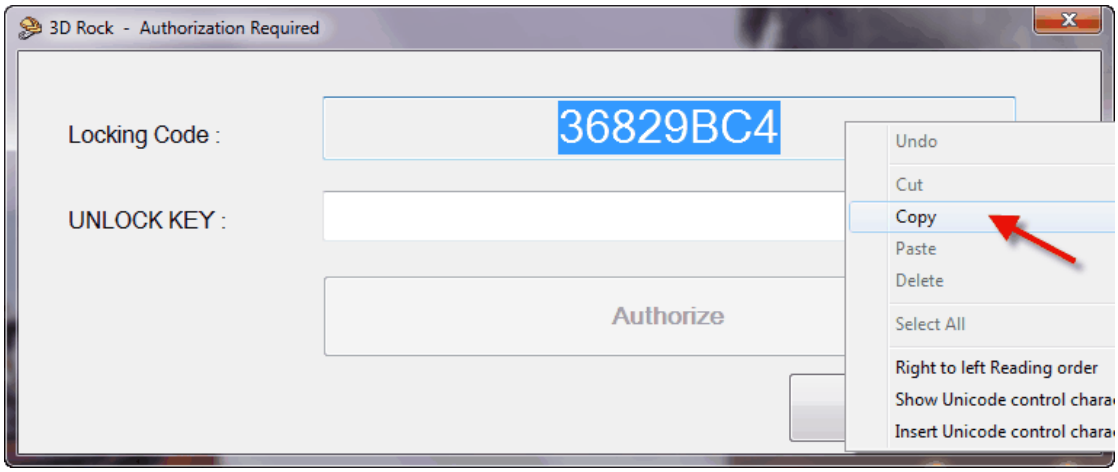
Part IV

4 Activation / Licensing

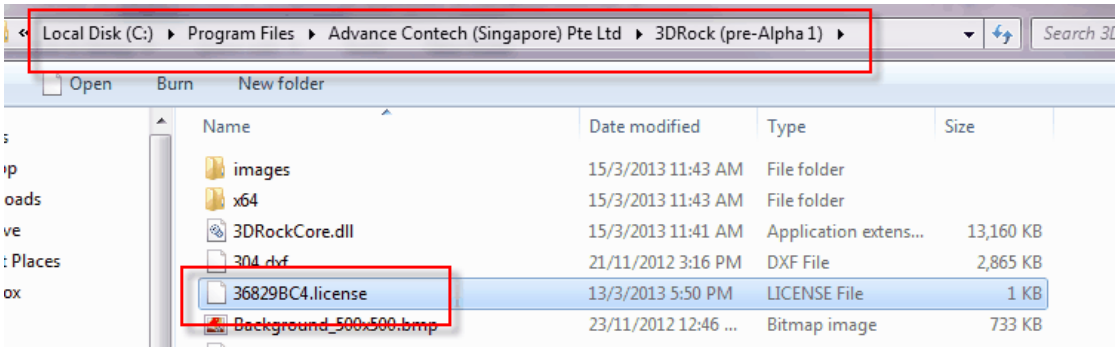
1. To prevent unauthorized execution, 3D Rock needs to be activated on each new computer that it is being installed on.

2. Upon first execution after the installation, a dialog box will show the Locking Code.



3. Copy and email the Locking Code to ***info@advance-contech.com***.

4. Advance Contech will send you a .license file. Copy the .license file to the program installation folder, typically located in **"C:\Program Files\Advance Contech (Singapore) Pte Ltd\3D Rock\".**



5. Restart 3DROCK+.

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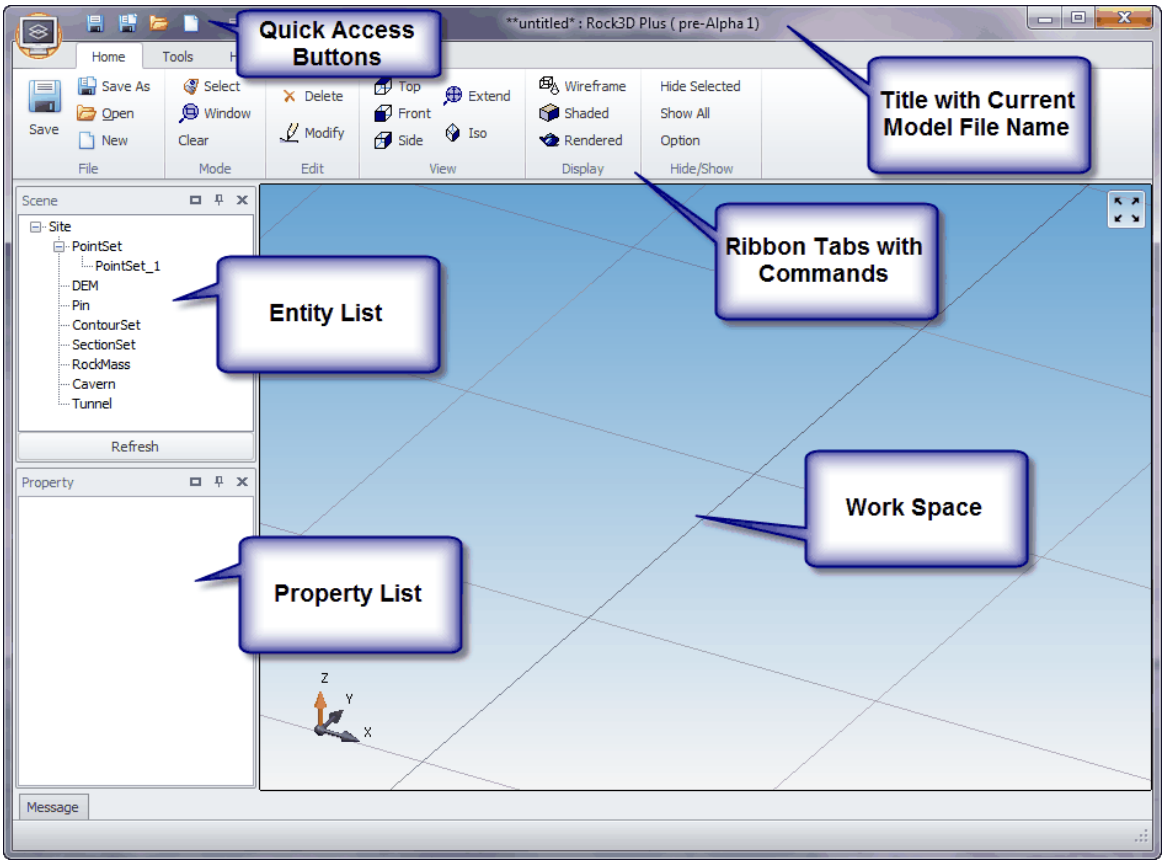
Part V

5 GUI quick glance



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Part VI

6 General Workflow

1. Import PointSet from DXF file[42].
2. Create DEM from PointSet[50], or import from VEGGIS DEM[48].
3. Create ContourSet (horizontal contour lines) from DEM[60].
4. Export ContourSet to DXF file[63].
5. Apply DOM to improve visuals[54].
6. Create SectionSet (i.e. Fence Diagram).[65]
7. Create Rock Mass using two DEMs[67] or by using Polylines[68].
8. Create Tunne[71]l and Cavern[73].
9. Measure the area and volume[77] of DEM, Rock Mass, Tunnel and Cavern.
10. Combine Tunnel and Cavern[81].
11. Import[83] and add[85] borehole from AGS(SG) data sets.
12. Extract[90] and plot graph[86] against selected borehole data.
13. Define construction stages[96] and perform real-time walk through[95].

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Part VII

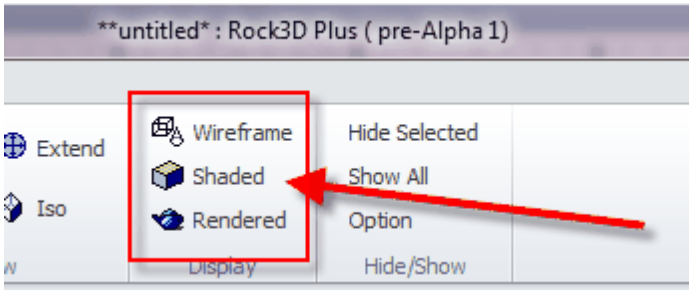
7 Common Tasks

Abbreviation used in the following chapters.

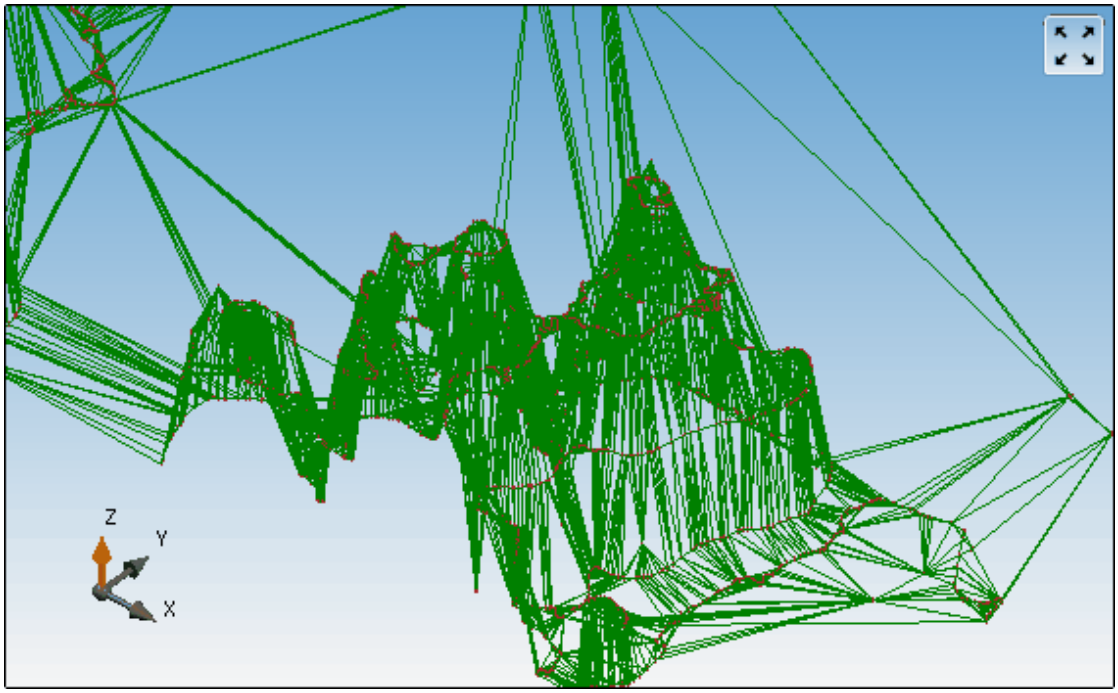
[LMB] = Left Mouse Button
[MMB] = Middle Mouse Button
[RMB] = Right Mouse Button

7.1 Change View Mode

Click Home > Display > Wireframe | Shaded | Rendered select how the model is displayed in the Work Space.



Wireframe Mode



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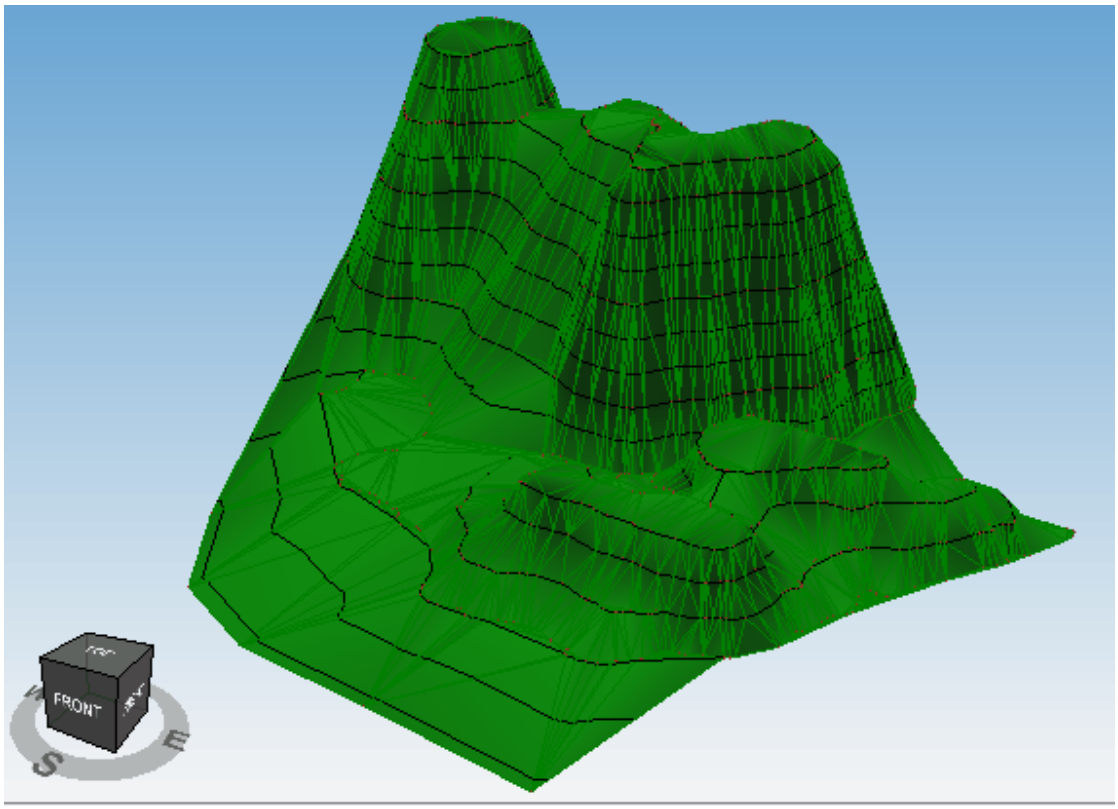
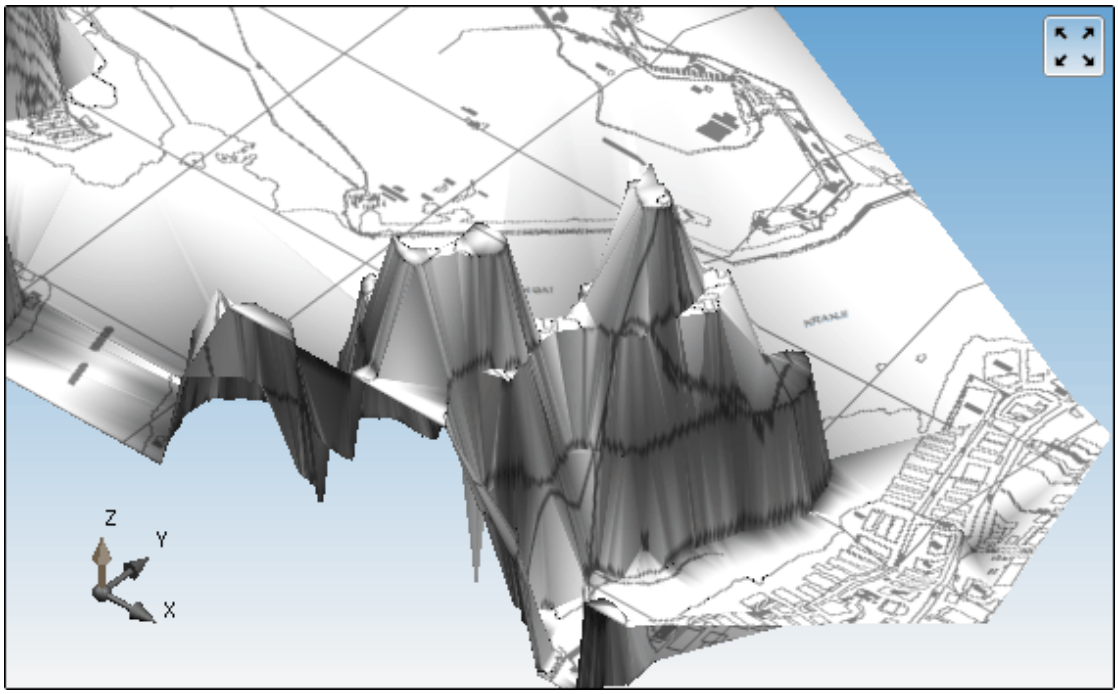
Shaded Mode



Rendered Mode



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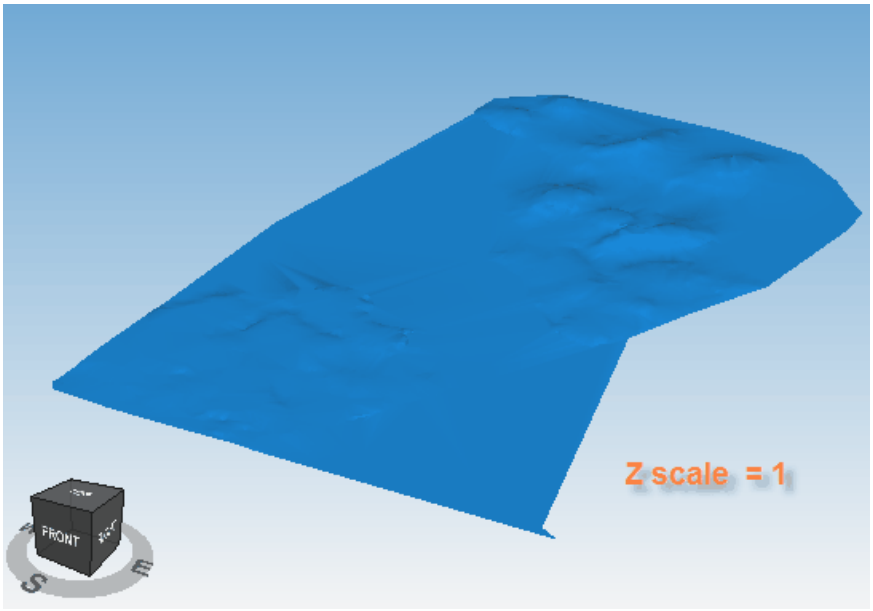
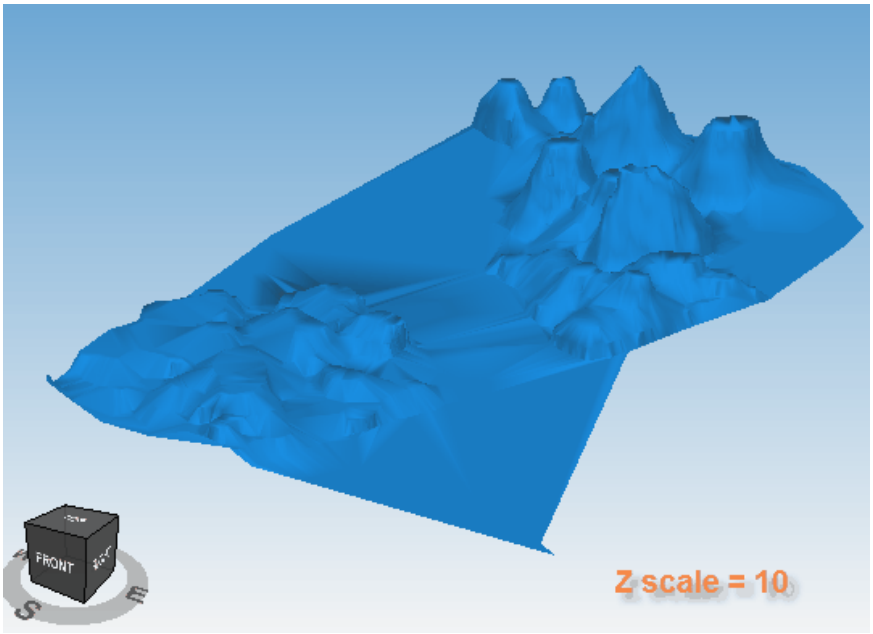
7.2 To make DEM profile distintive

To exaggerate the DEM profile, user may enter a larger Z scale using the System > Height > Z scale 98 command.





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7.3 Pan / Zoom / Rotate view

Pan

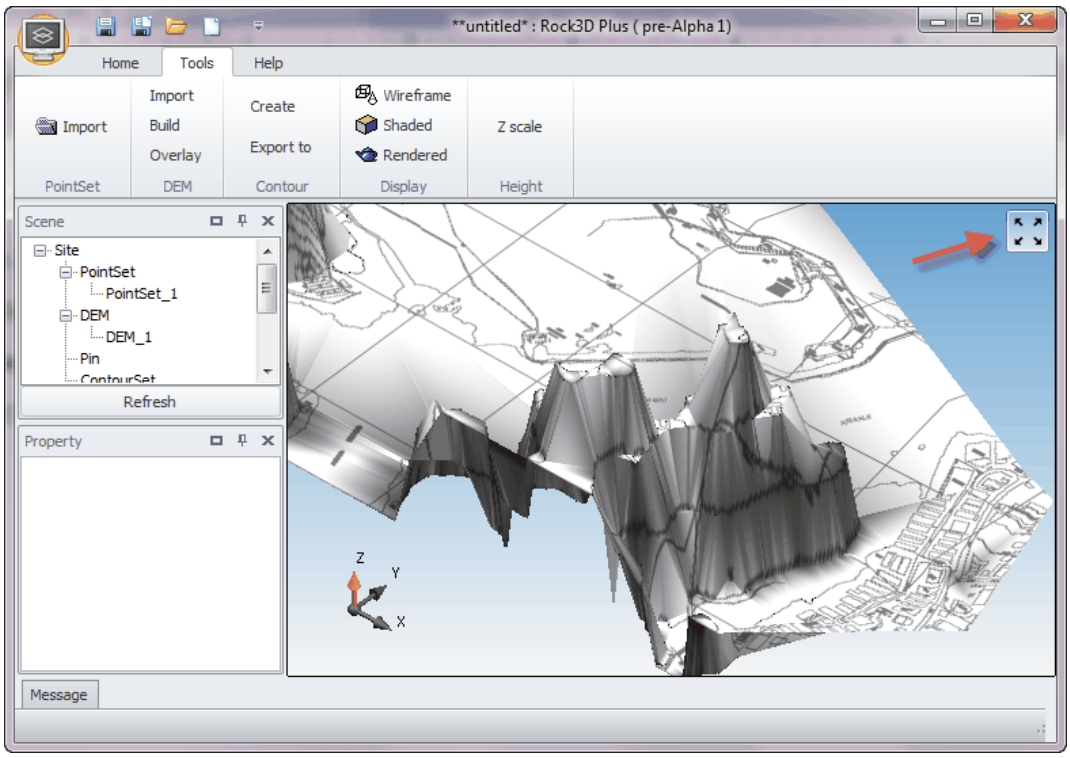
Press and hold middle mouse button while dragging

Dynamic Zoom

Scroll [MMB] while cursor is within the Work Space

Zoom Extend

Click the [Zoom Extend] icon at the upper right corner of the Work Space



Rotate

Click and hold [RMB] while dragging in Work Space.

Rotate to specific view plane

by either

a] clicking the [Top], [Front], [Side], [Iso] buttons.

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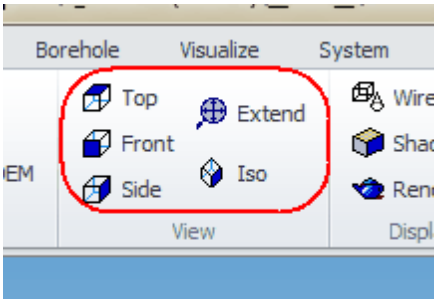
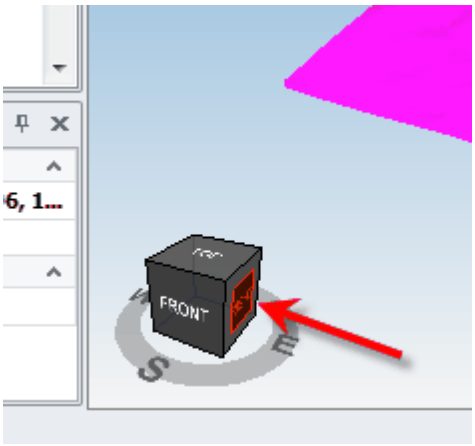


b] clicking the faces of the view cube.



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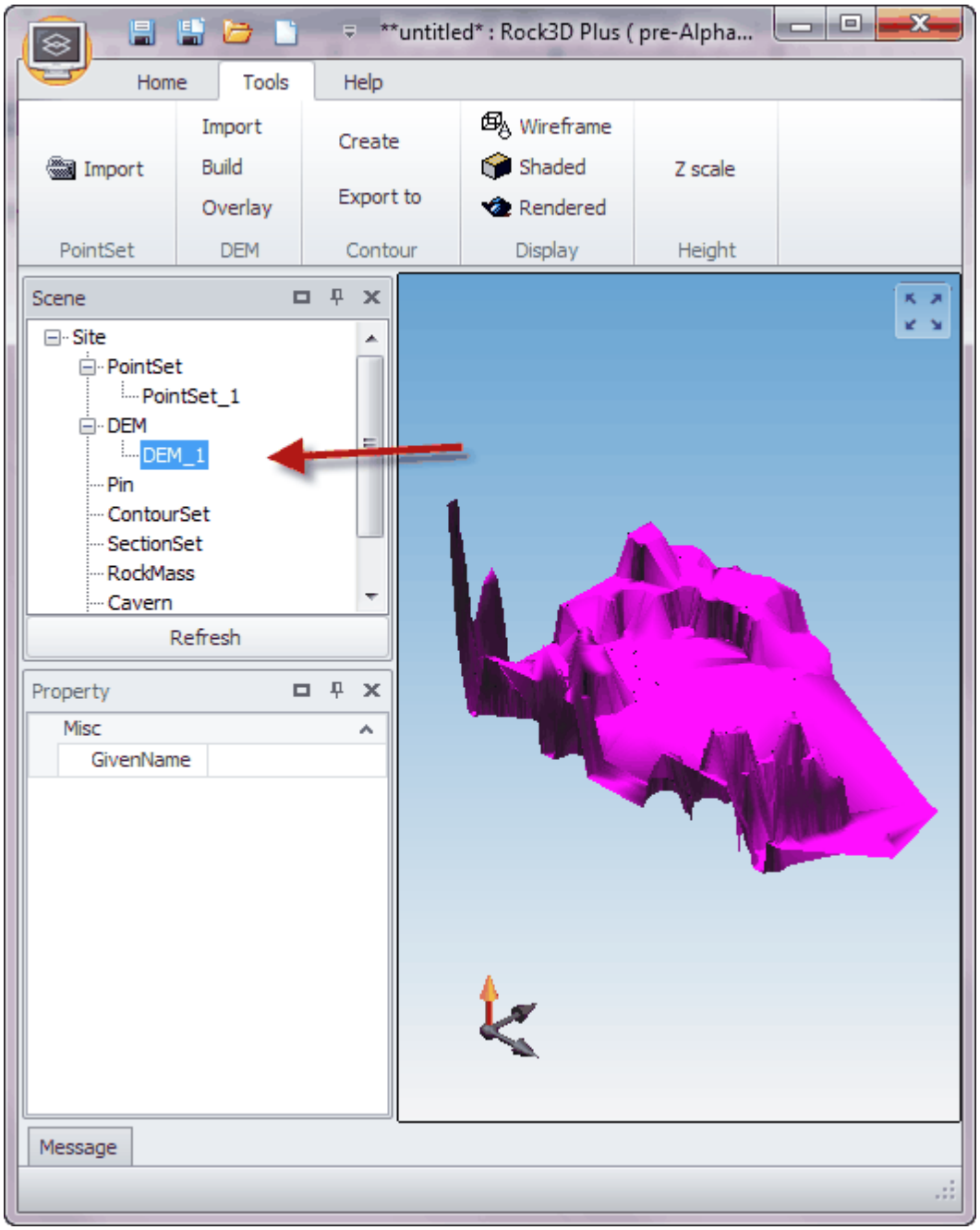
7.4 Select / De-select Entity

Select Entity

- clicking at the Entity Name in the Entity List



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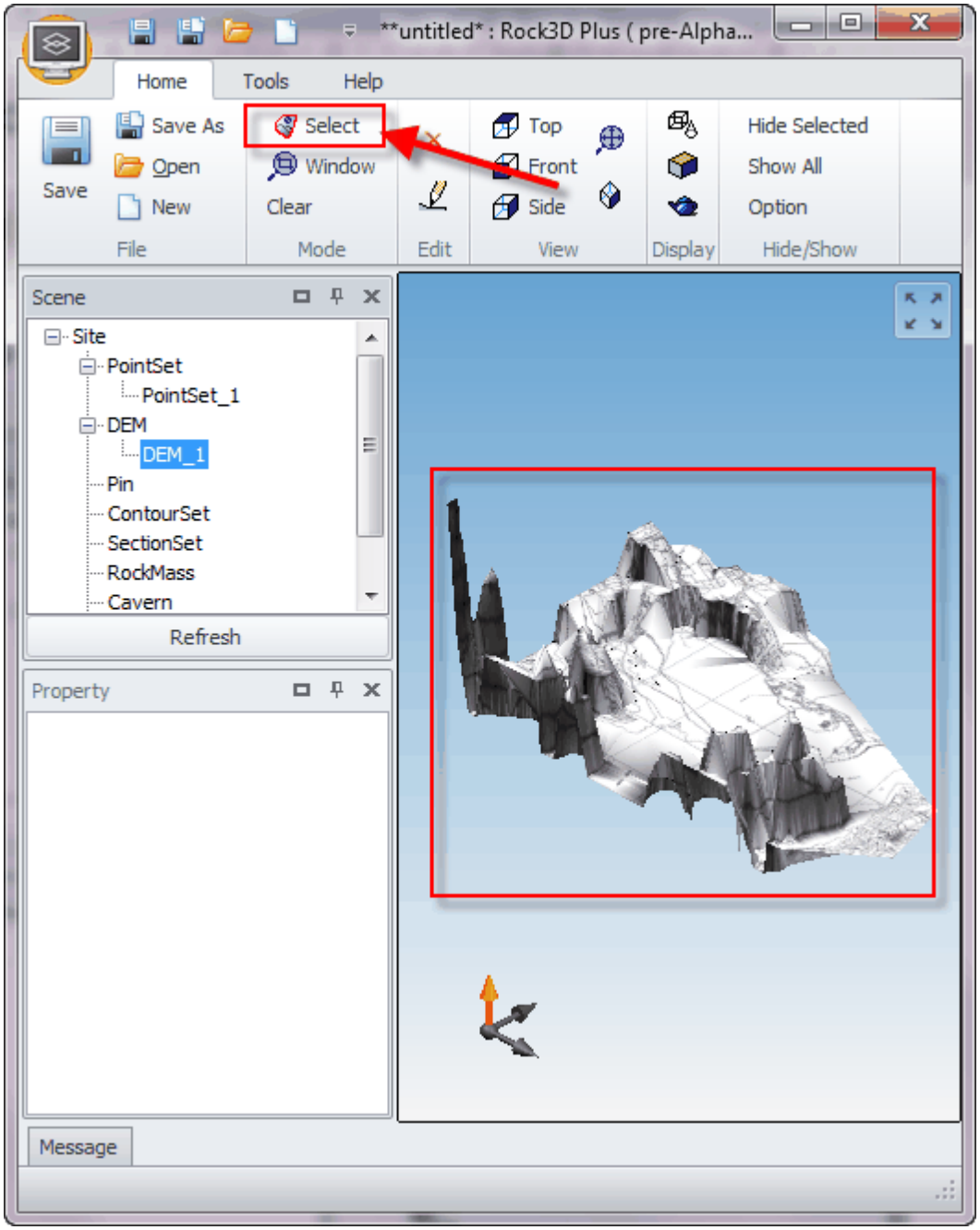
- clicking Home > Mode > Select, click hold [LMB] to enclose all the entities to be selected in the Work Space



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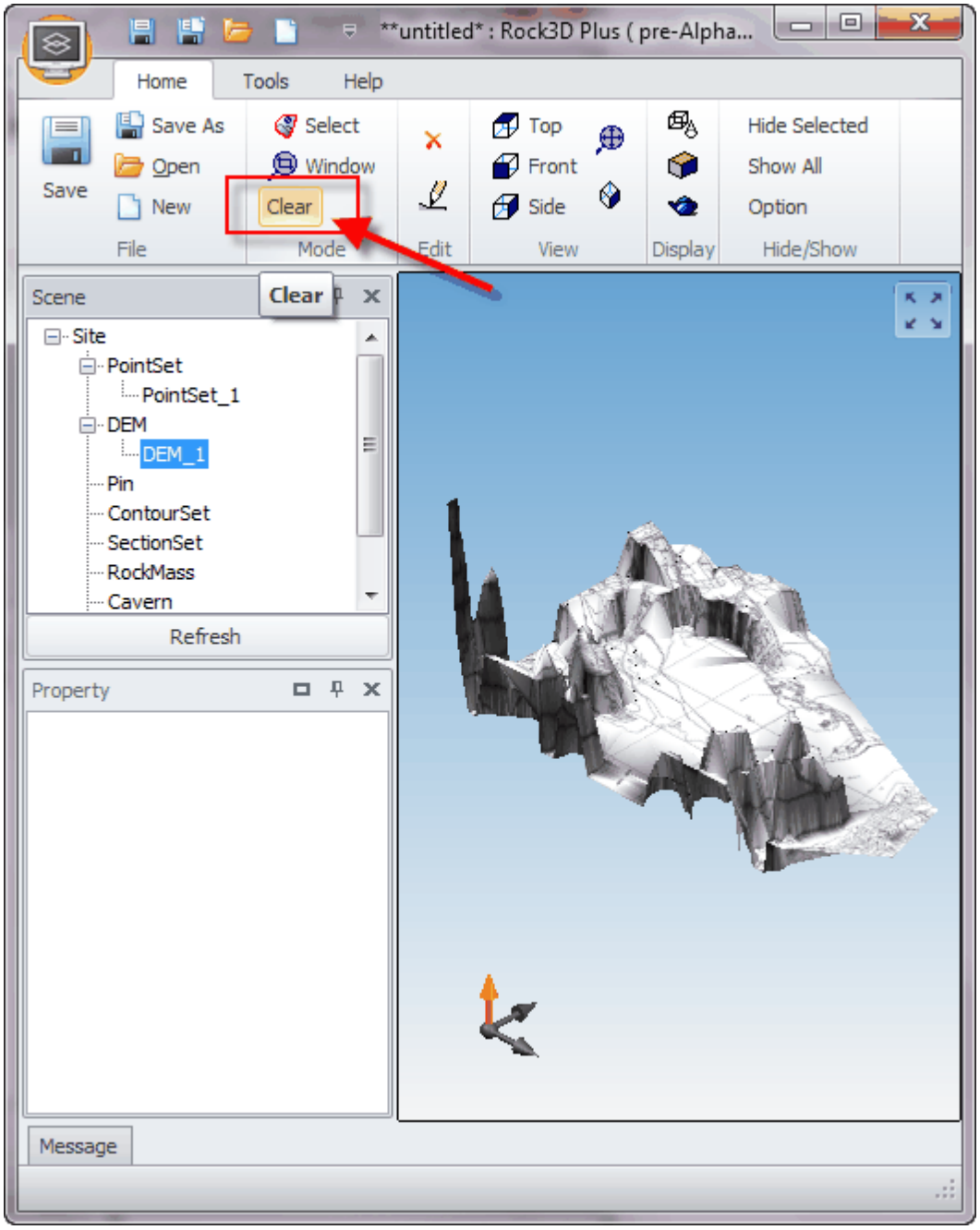
De-select Entity

Click Home > Mode > Clear



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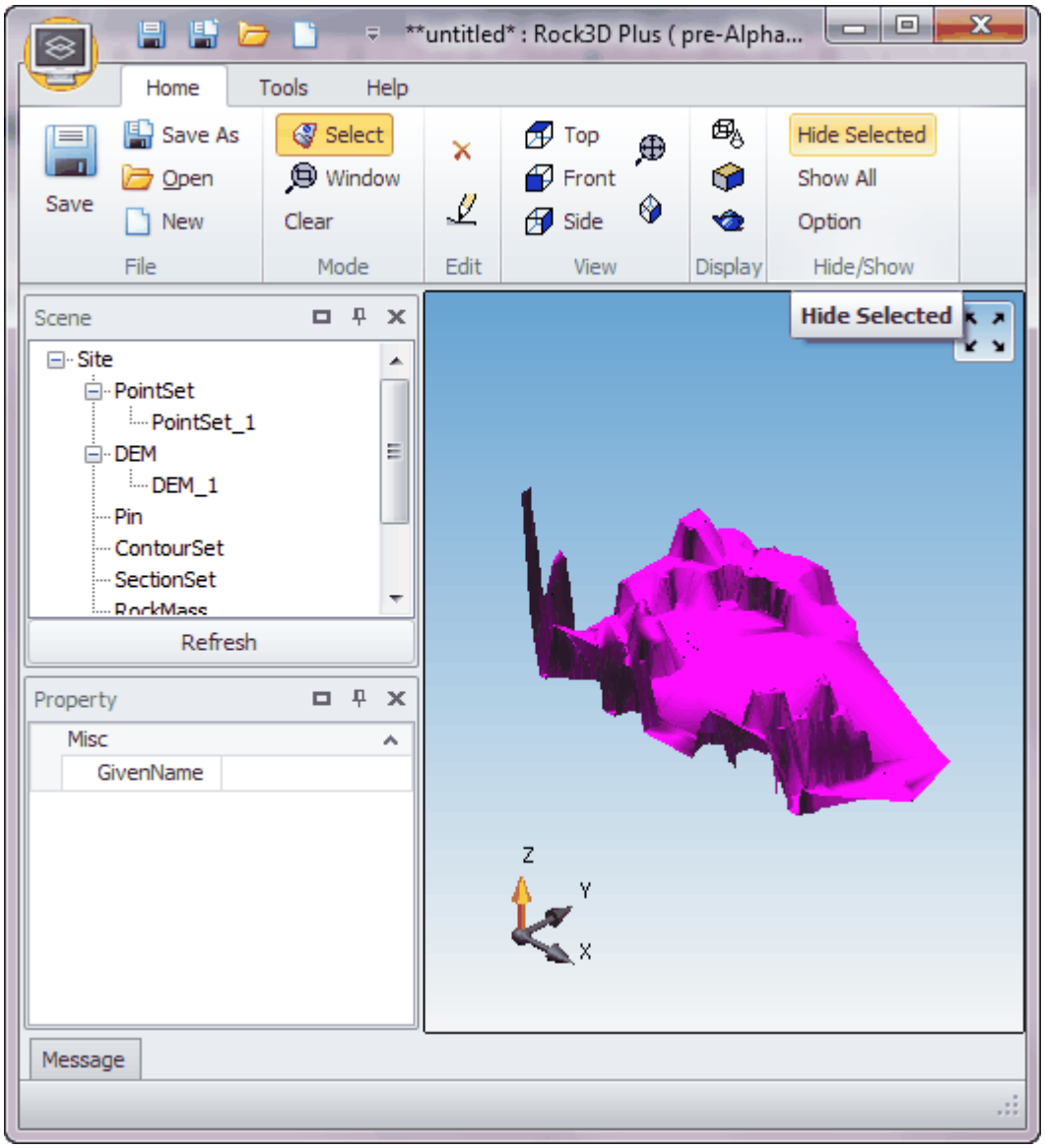
7.5 Show/Hide by Selection

To Hide

Select the entity, click Home > Hide/Show > Hide Selected.



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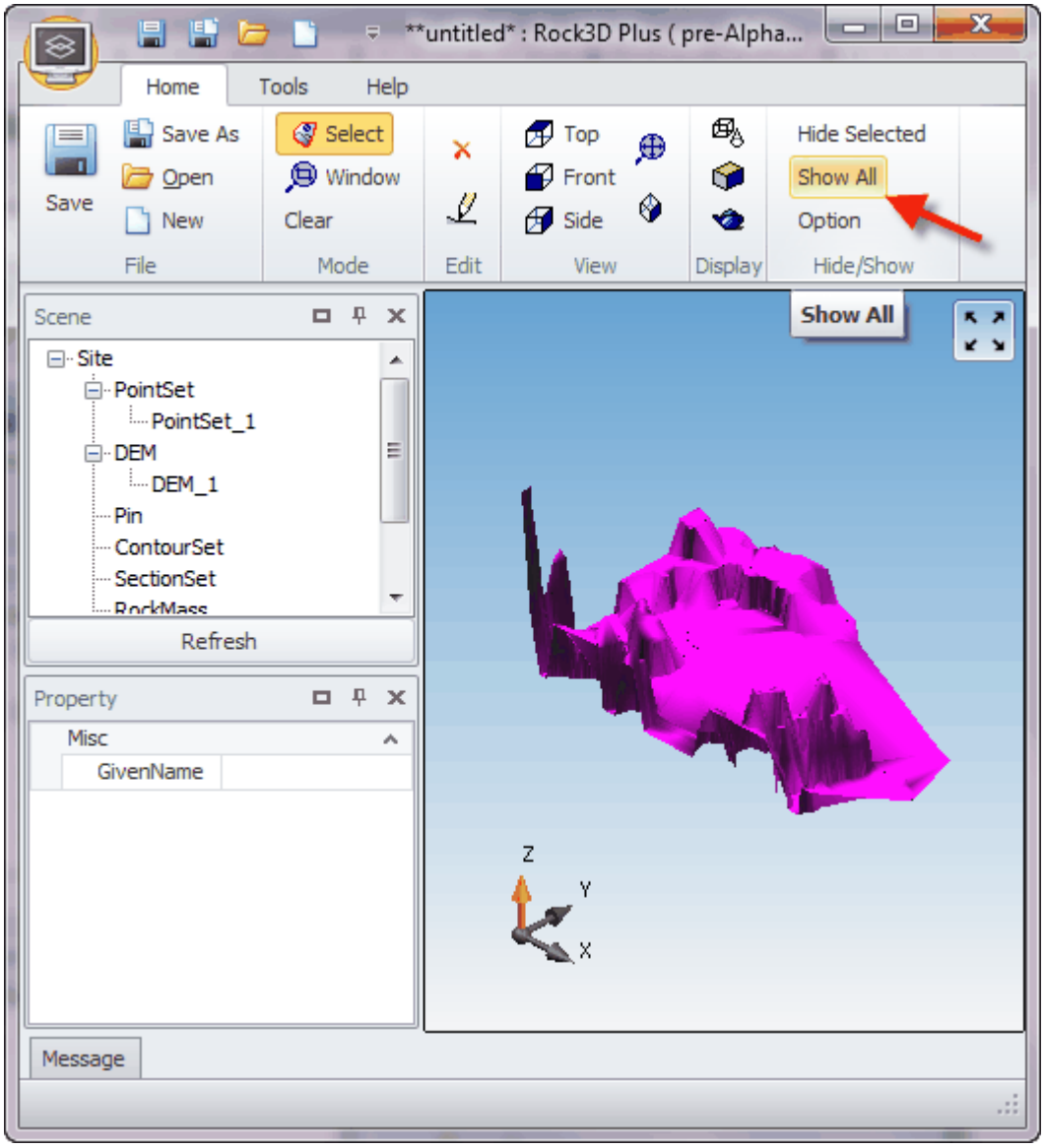
To Show

Click Home > Hide/Show > Show All.



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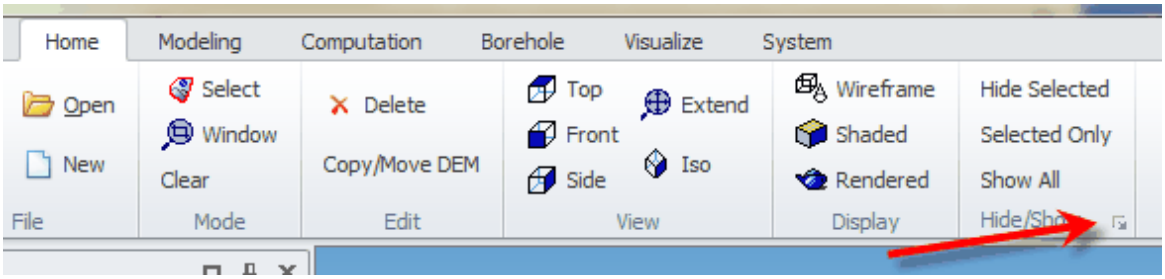
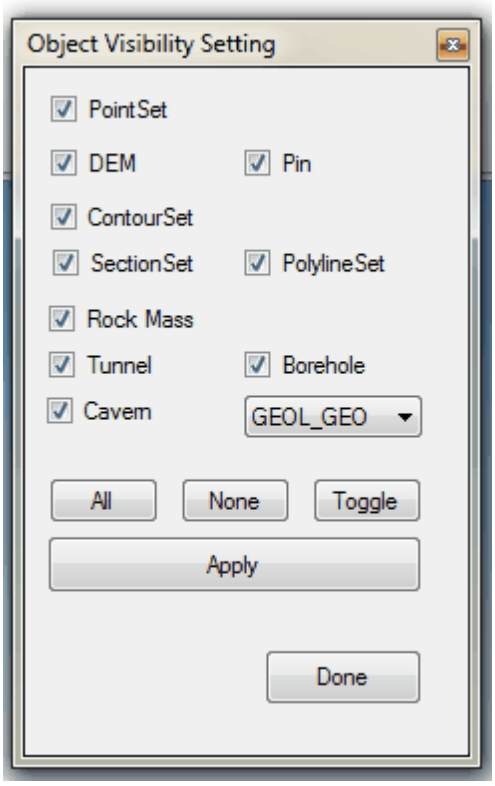
7.6 Show/Hide by Type

1. Click Home > Hide/Show Quick Access Icon.



2. Check / Un-check the desired type of object to hide/show.

3. Click [Apply].



4. Click [Done] to close tool box.

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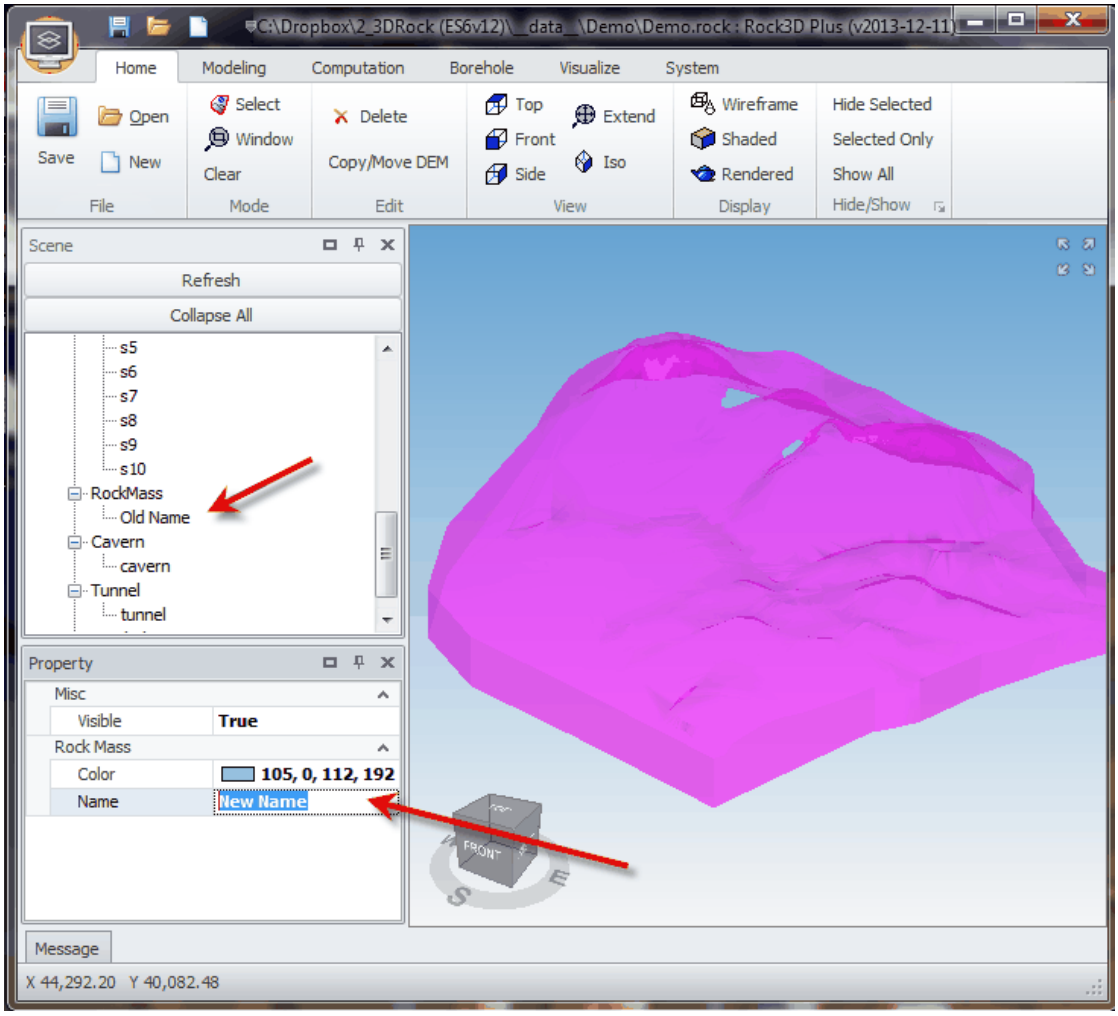
7.7 Rename Entity

Click Entity Name in Entity List, type the new name in Property field, and hit [Enter].



Note : Name cannot contain space character.

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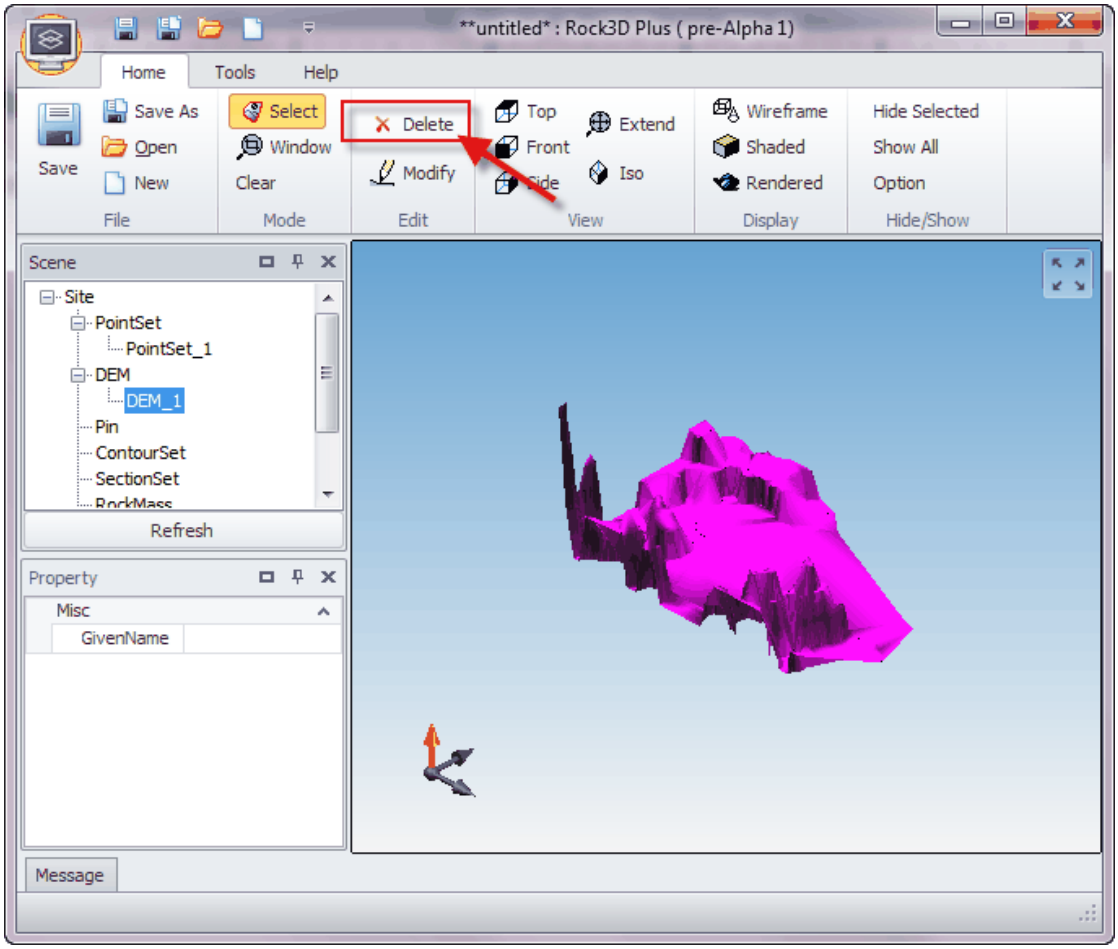
7.8 Delete Entity

1. Select Entity, click Home > Edit > Delete.



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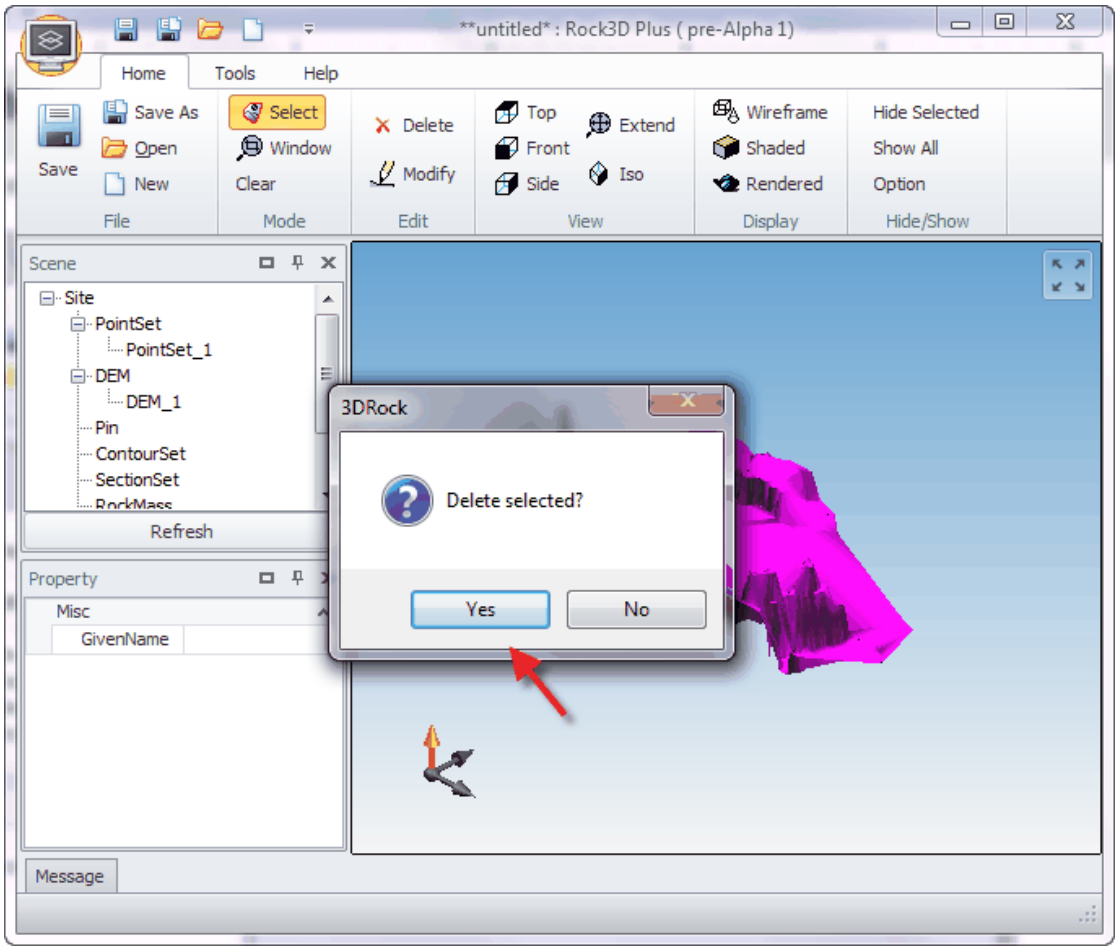
2. Click [Yes] to delete the selected Entity



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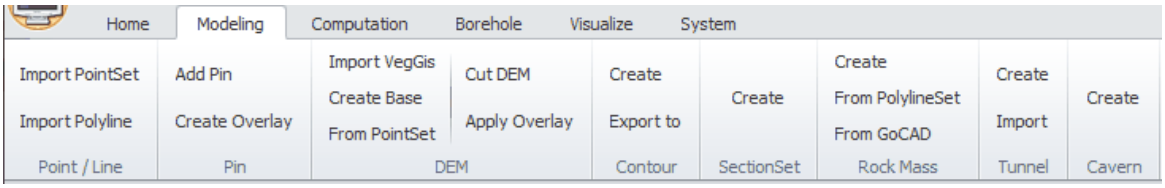
Part VIII

8 Commands

8.1 Modeling

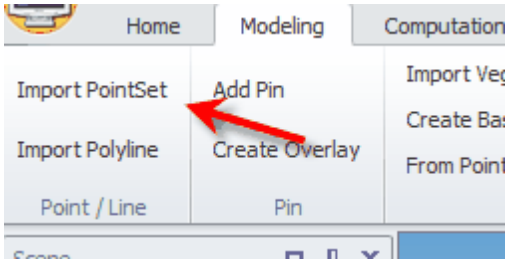


8.1.1 Point / Line

Enter topic text here.

8.1.1.1 Import PointSet

1. Click Modeling > Point / Line > Import PointSet
2.



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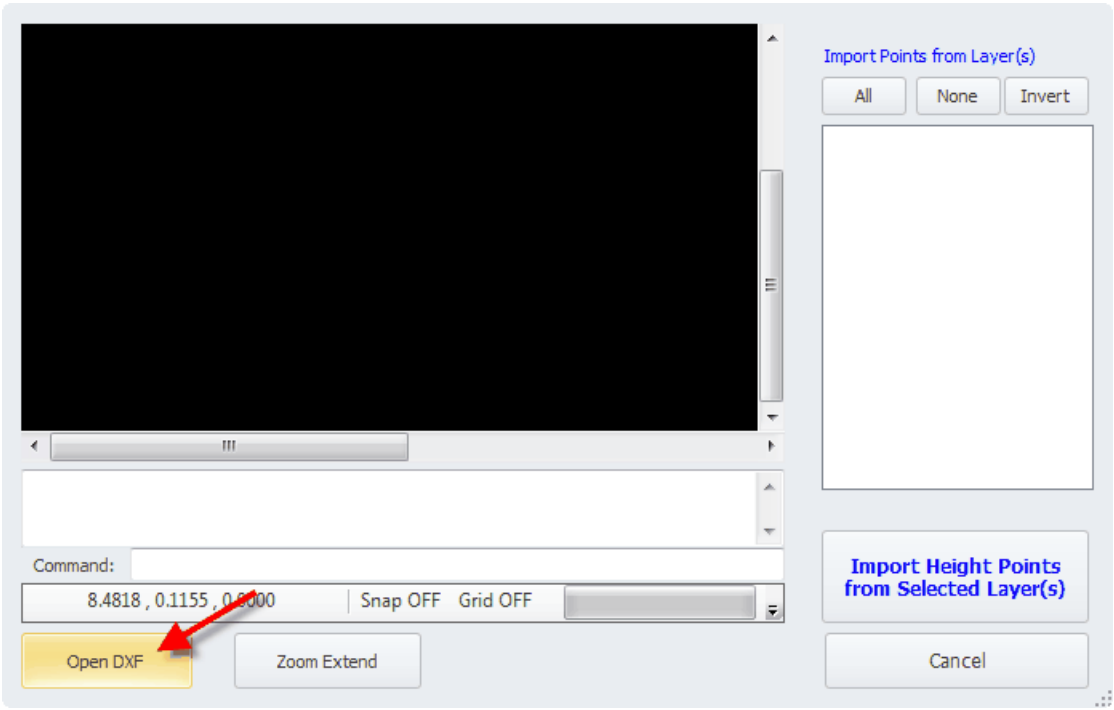
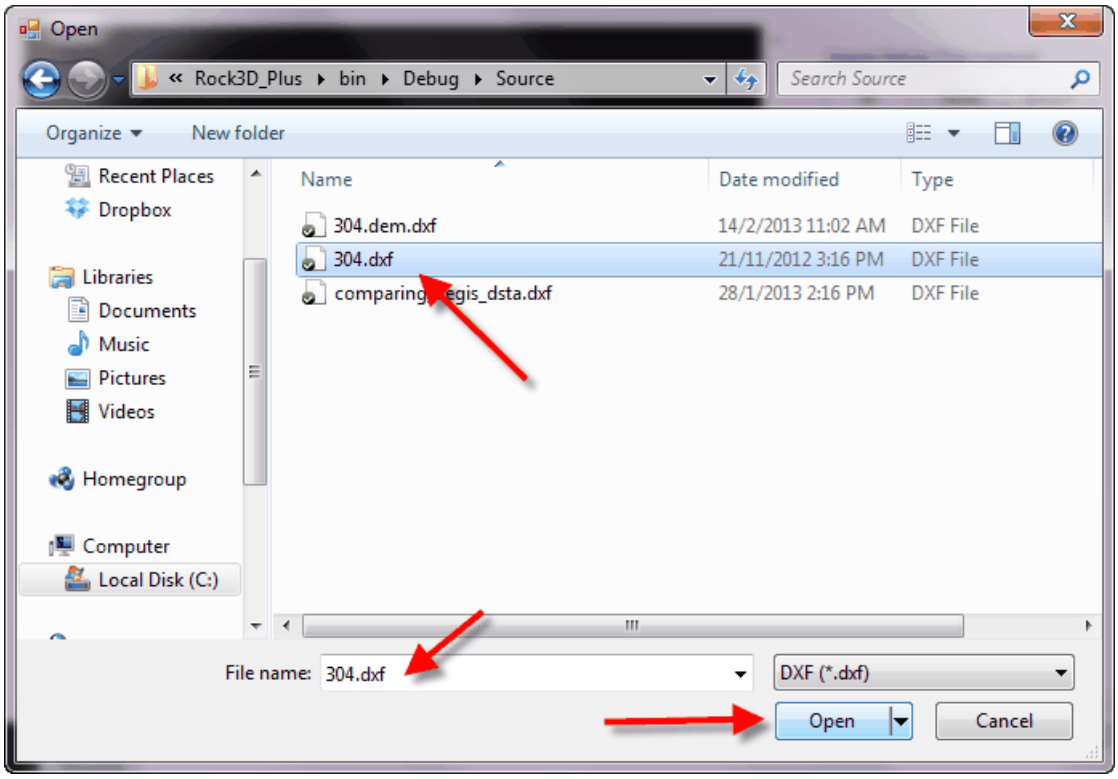
3. Click [Open DXF]



4. Select the DXF file, click [Open]



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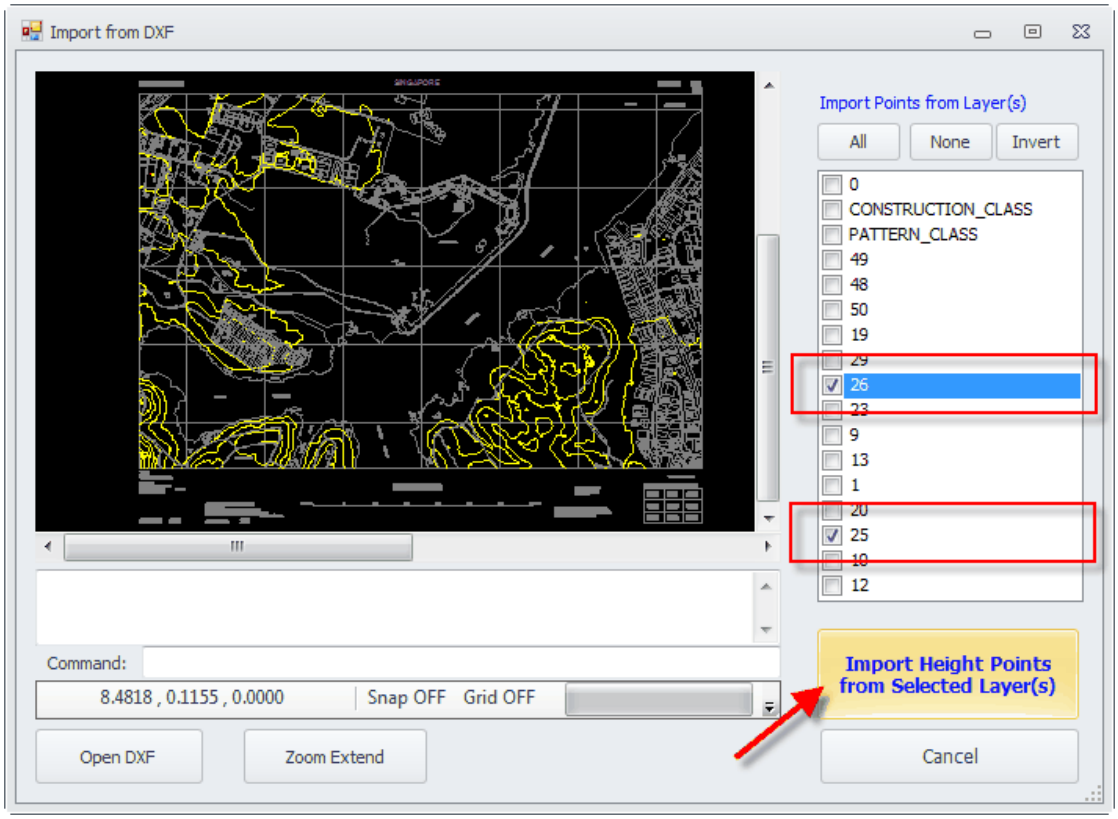
5. Check (Select) the layers containing height points to be imported, click [Import Height Points from Selected Layer(s)].



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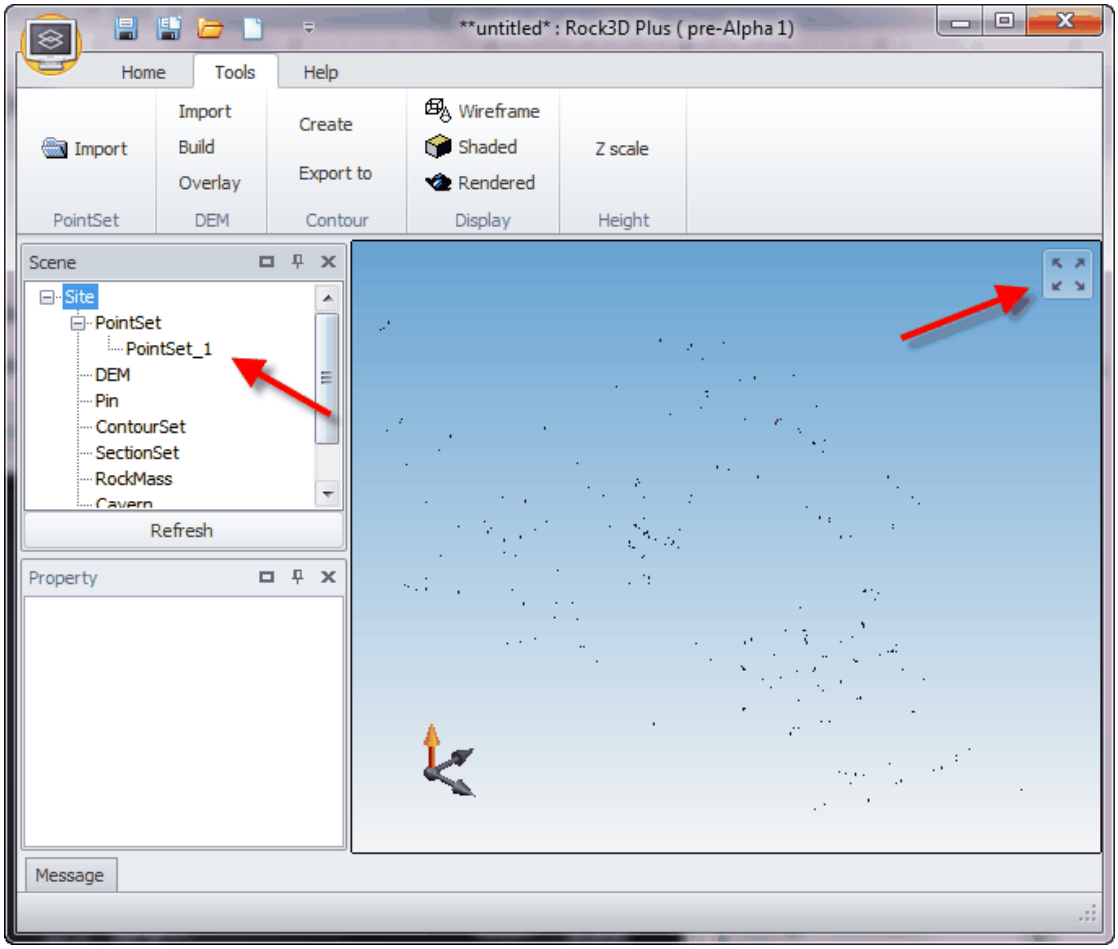
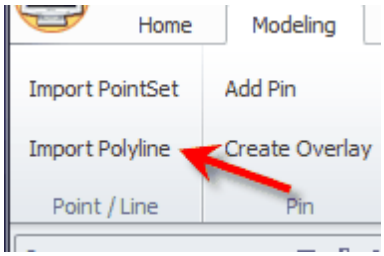
6. New height points are all imported and grouped under a new collection under "PointSet" header, click [Zooom Extend] icon to adjust the Work Space to display them



8.1.1.2 Import Polyline

1. Click Modeling > Point / Line > Import Polyline



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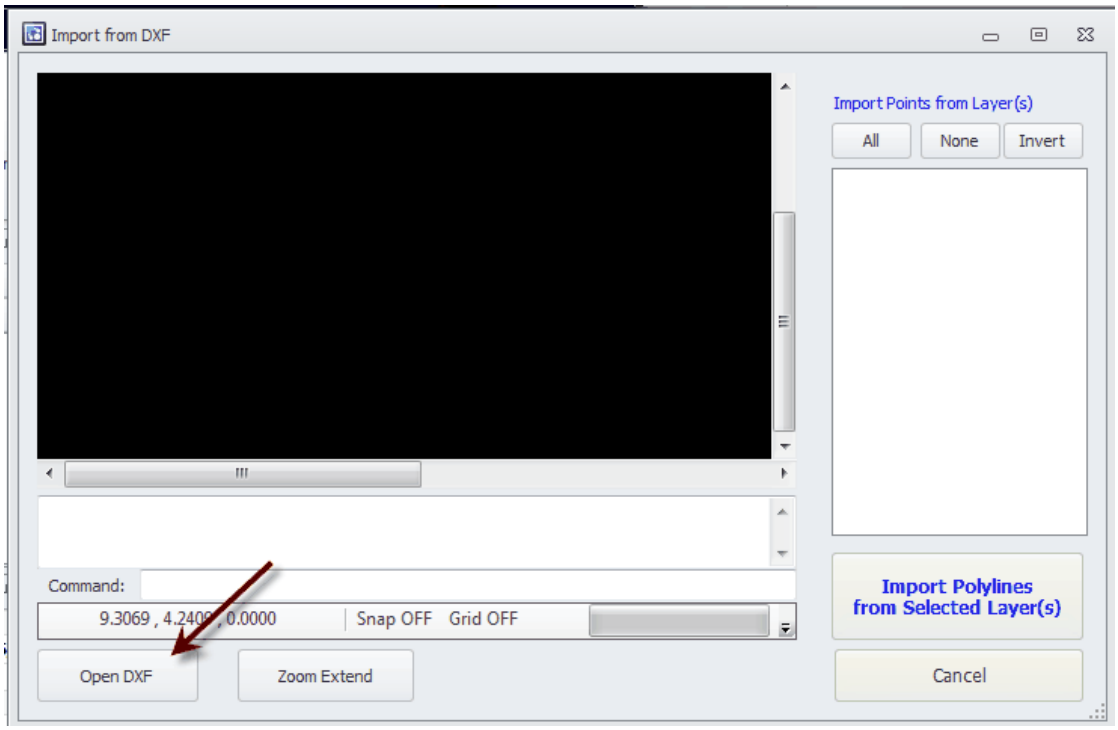
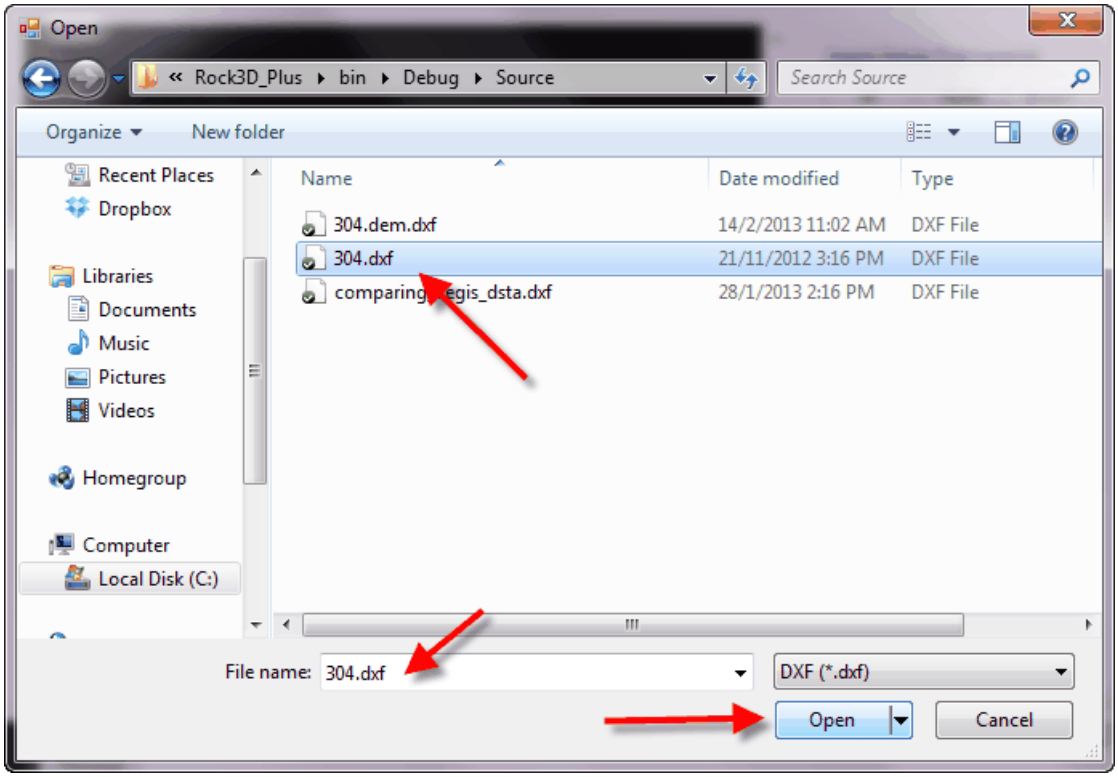
2. Click [Open DXF]



3. Select the DXF file, click [Open]



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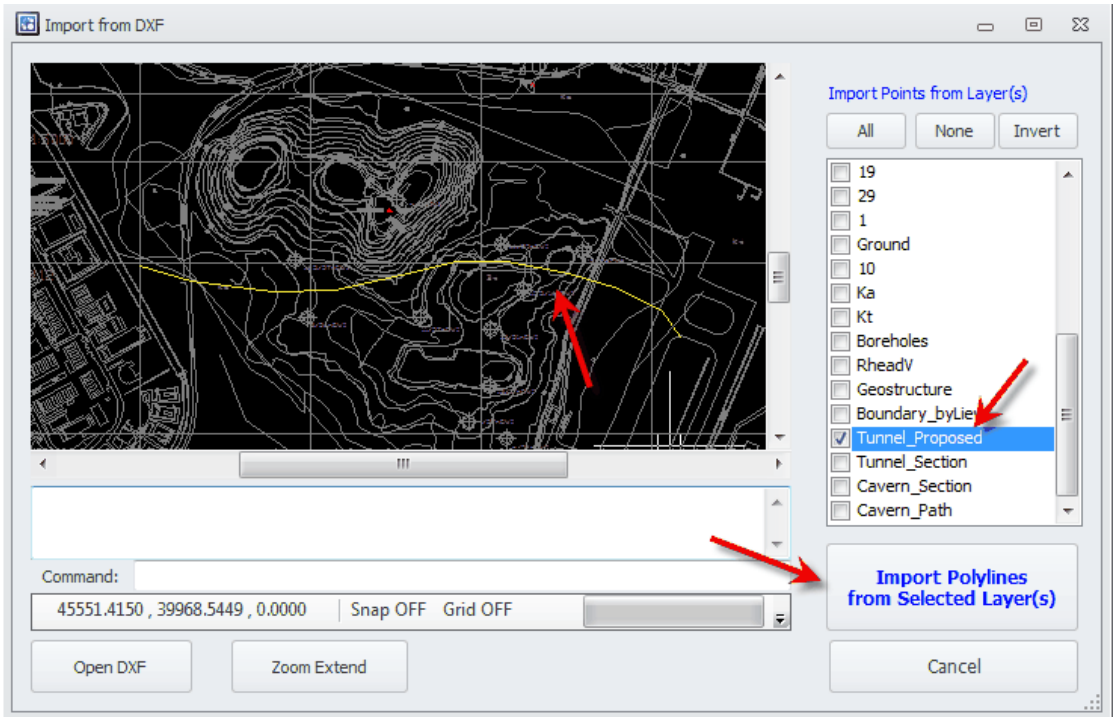
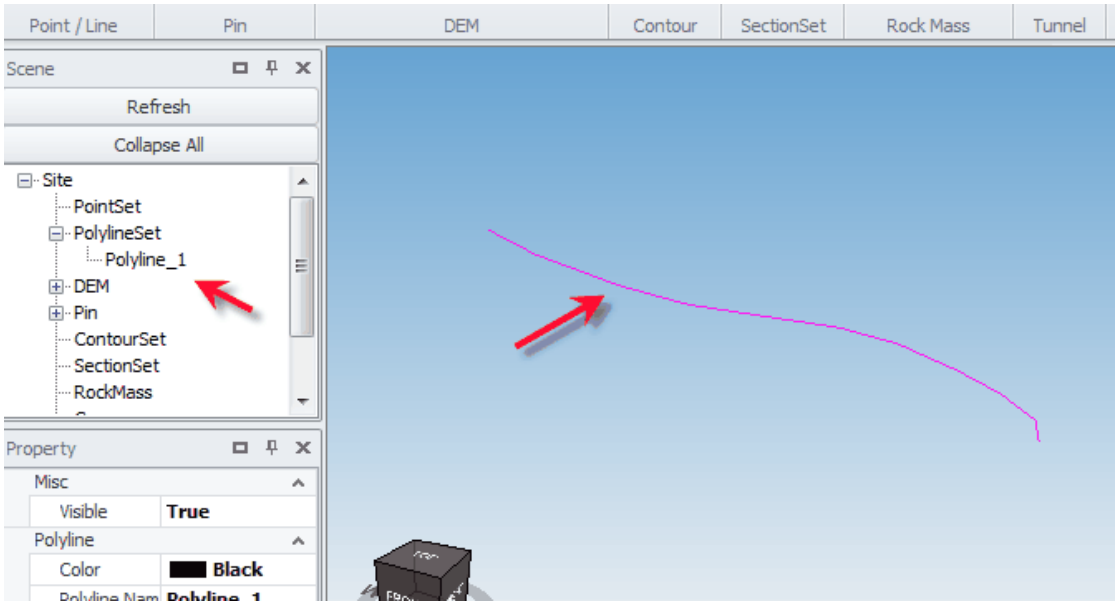
4. Check (Select) the layers containing the features to be imported, click [Import Polylines from Selected Layer(s)].



5. New feature polylines are all imported and grouped under a new collection under "PolylineSet" header, click [Zooom Extend] icon to adjust the Work Space to display them



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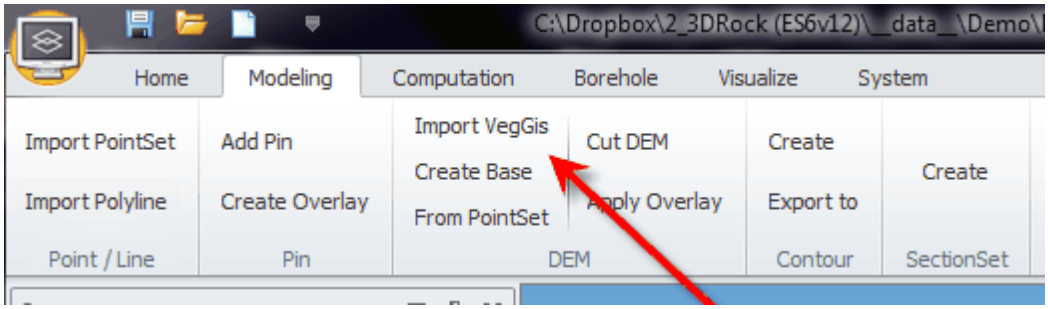
8.1.2 DEM

8.1.2.1 Import VegGis

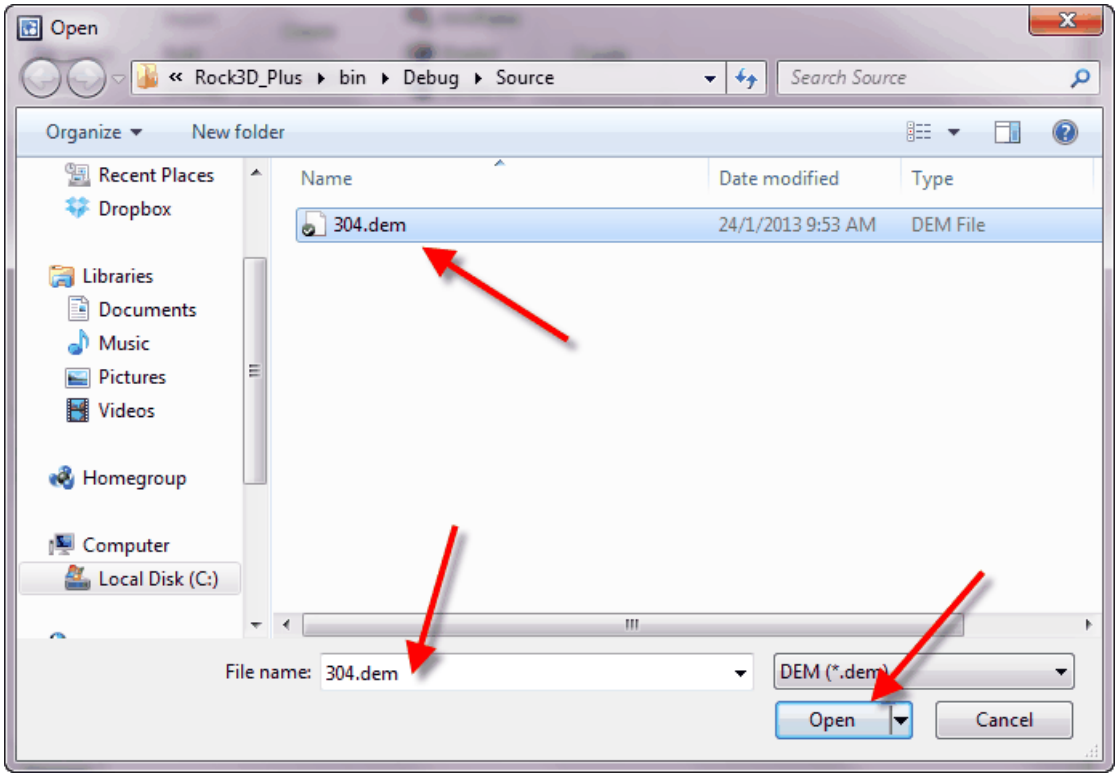
Use this tool to import an existing DEM layer from VegGis system.

Note: VegGis *.dem file format is incompatible with other GIS standard file format, hence this doesn't work on other *.dem files created by other GIS software.

1. Click Modeling > DEM > Import VegGis.



2. Select the VEGGIS DEM file, and click [Open].



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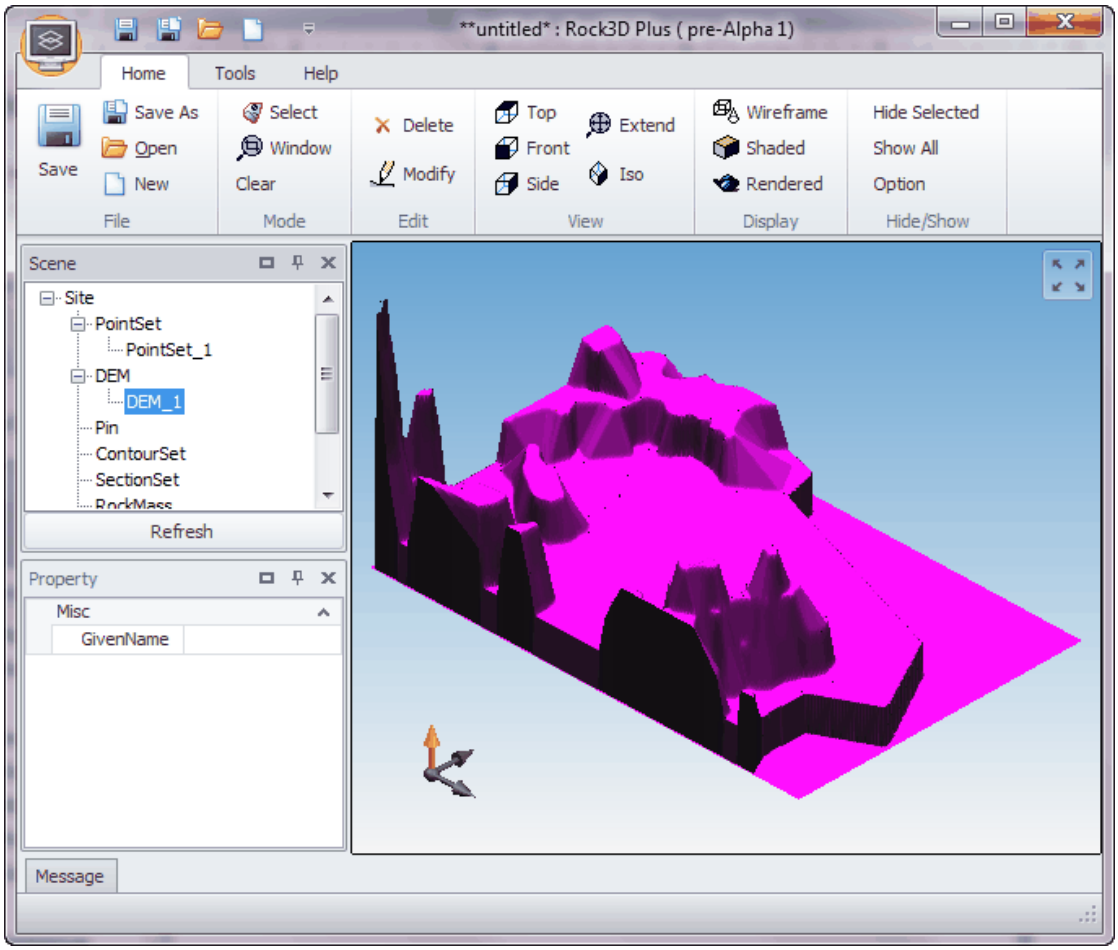
3. The imported DEM is added to the Entity List and displayed in Work Space.

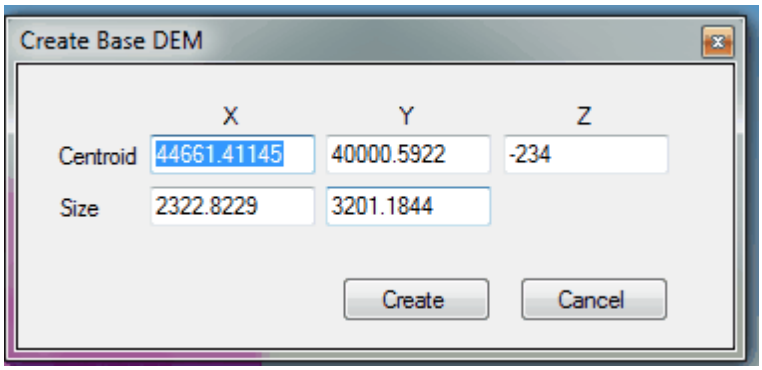


8.1.2.2 Create Base

Use this tool to create a planar DEM, typically as the top (or bottom) most bounding layer

1. Click Modeling > DEM > Create Base.

2. System will automatically calculate the current extent and centroid of the Scene. Adjust the values as necessary.



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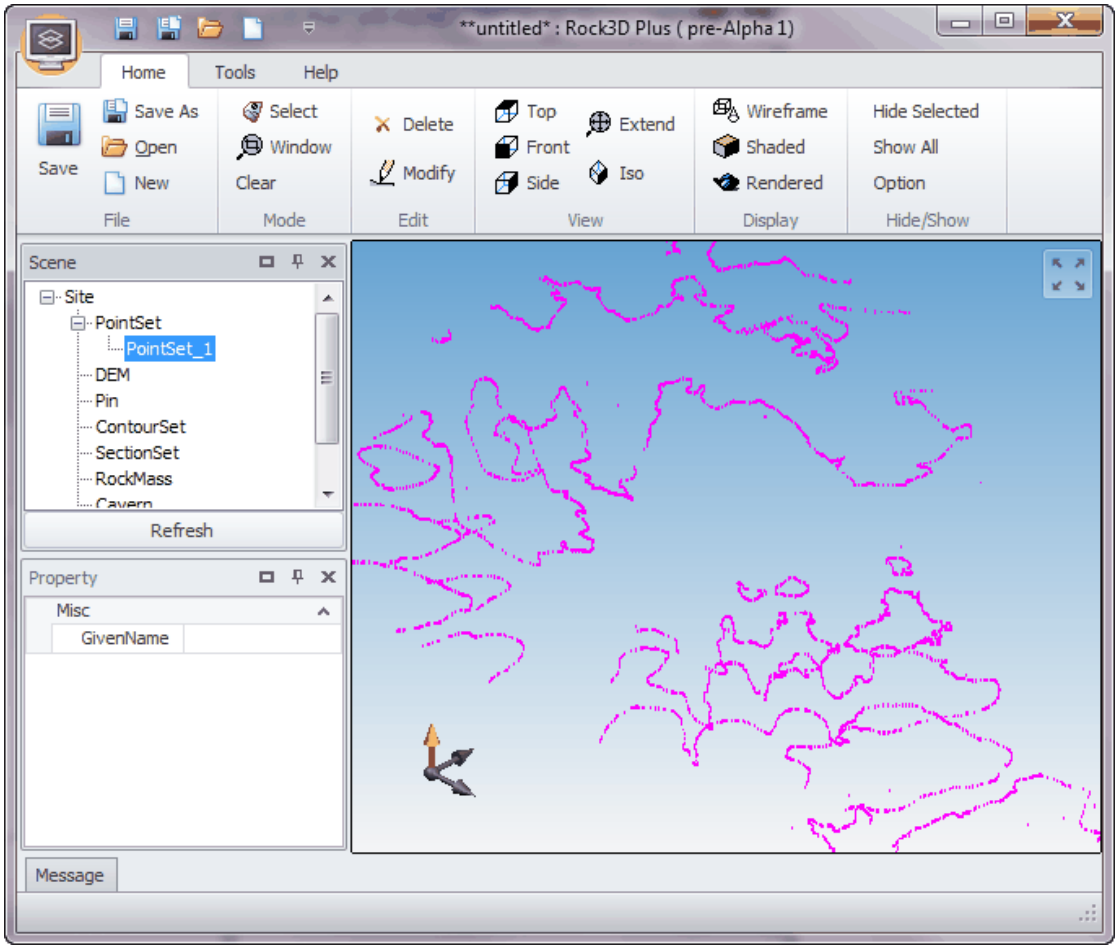
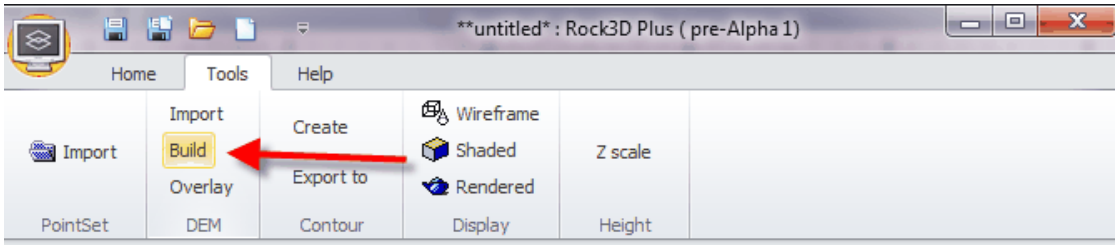
3. Click [Create]. A new DEM will be added to the Scene.

8.1.2.3 From PointSet

1. Select the PointSet



2. Click Modeling > DEM > From PointSet



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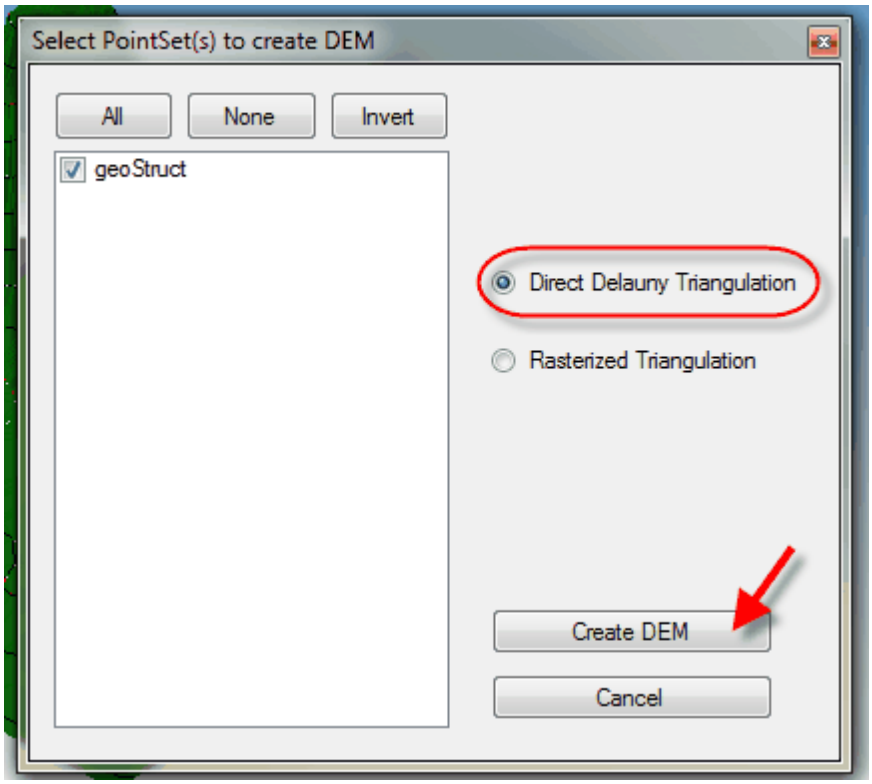
3. Choose the type of triangulation methods, click [Apply]



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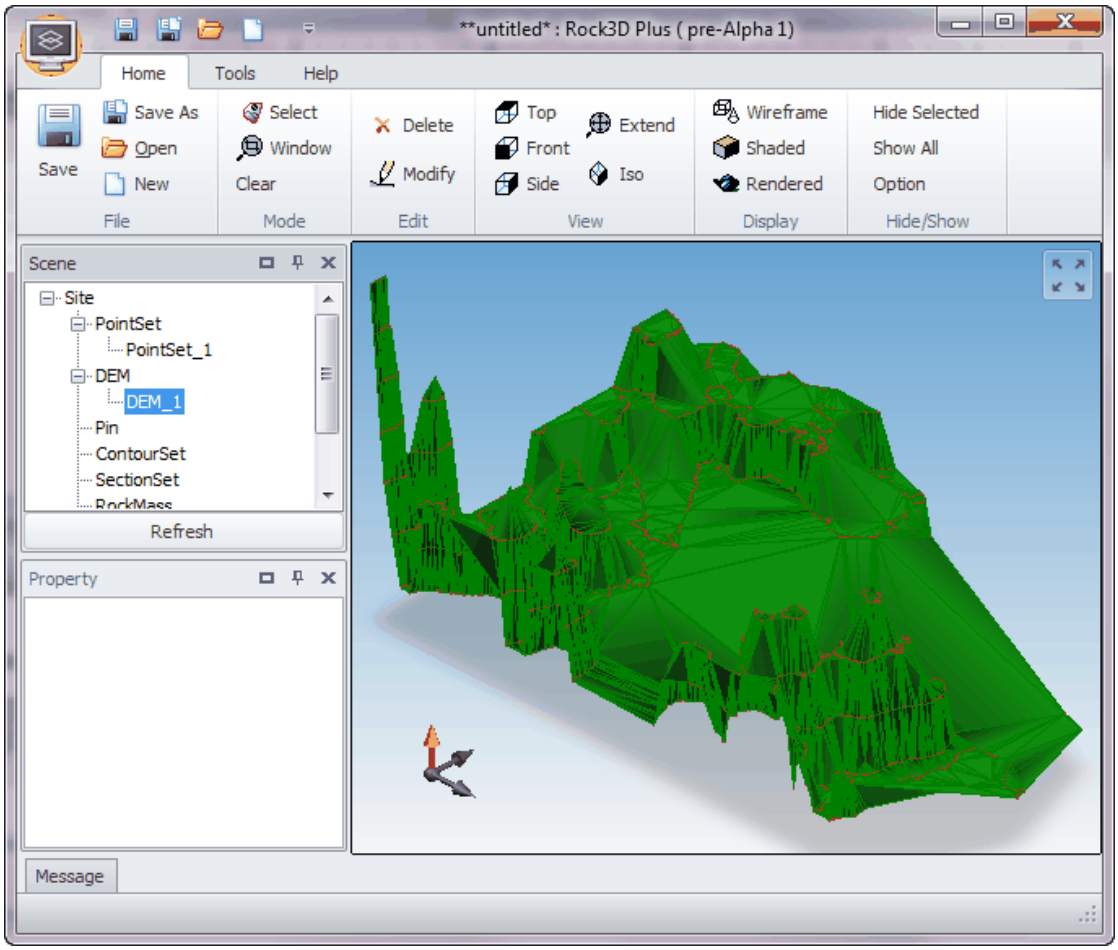
4. The created DEM is listed in Entity List and displayed in the Work Space.

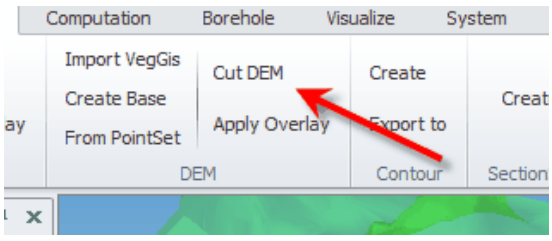


8.1.2.4 Cut DEM

Trim and extract a smaller portion out from a larger DEM.

1. Import a PolylineSet[42] containing the boundary of the smaller DEM. The PolylineSet shall contain only ONE polyline, of which the last vertex needs not be meeting its first vertex (i.e. an open polyline in DXF is acceptable).

2. Click Modeling > DEM > Cut DEM.



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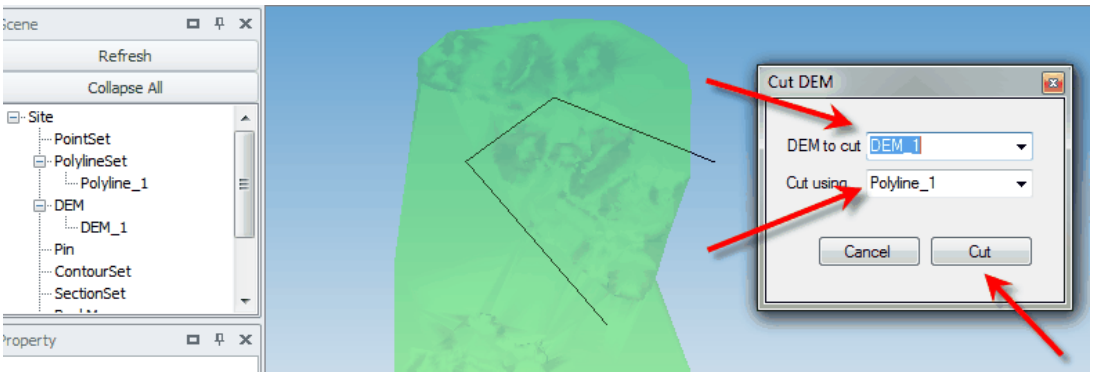
3. Select the DEM (to be cut) and the PolylineSet (as the boundary) from the drop down boxes. Click [Cut].



4. A new DEM will be created.

Note: This could be a time consuming process with complex DEM processed by using a low-end computer system.

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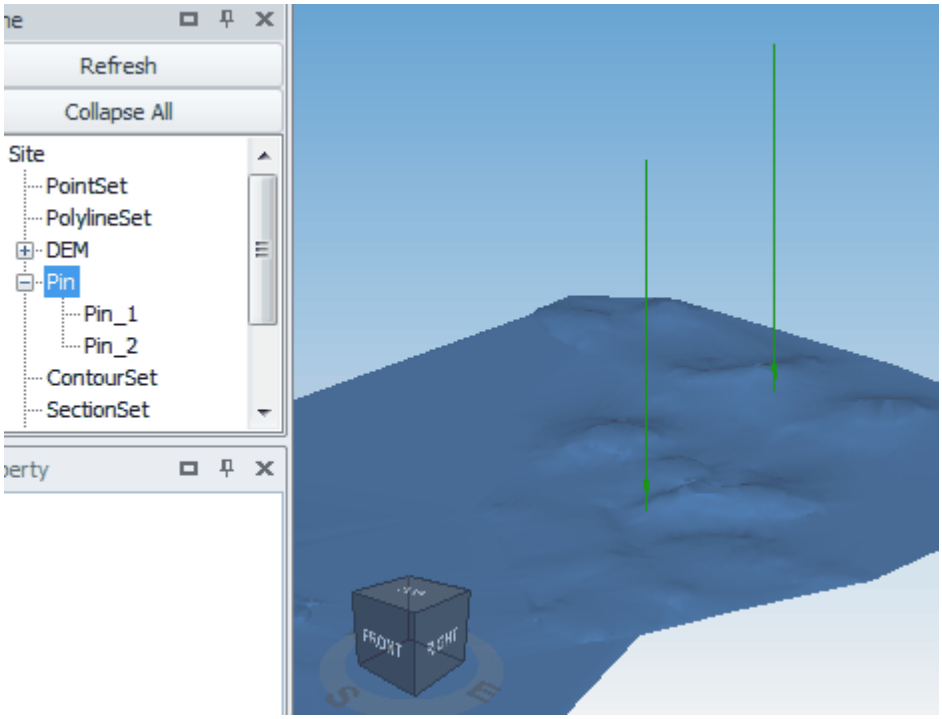
8.1.2.5 Create DOM (Overlay)

1. Create at least two Pins[59] pointing at two locations of the desired DEM.



2. Click Modeling > Pin > Create Overlay

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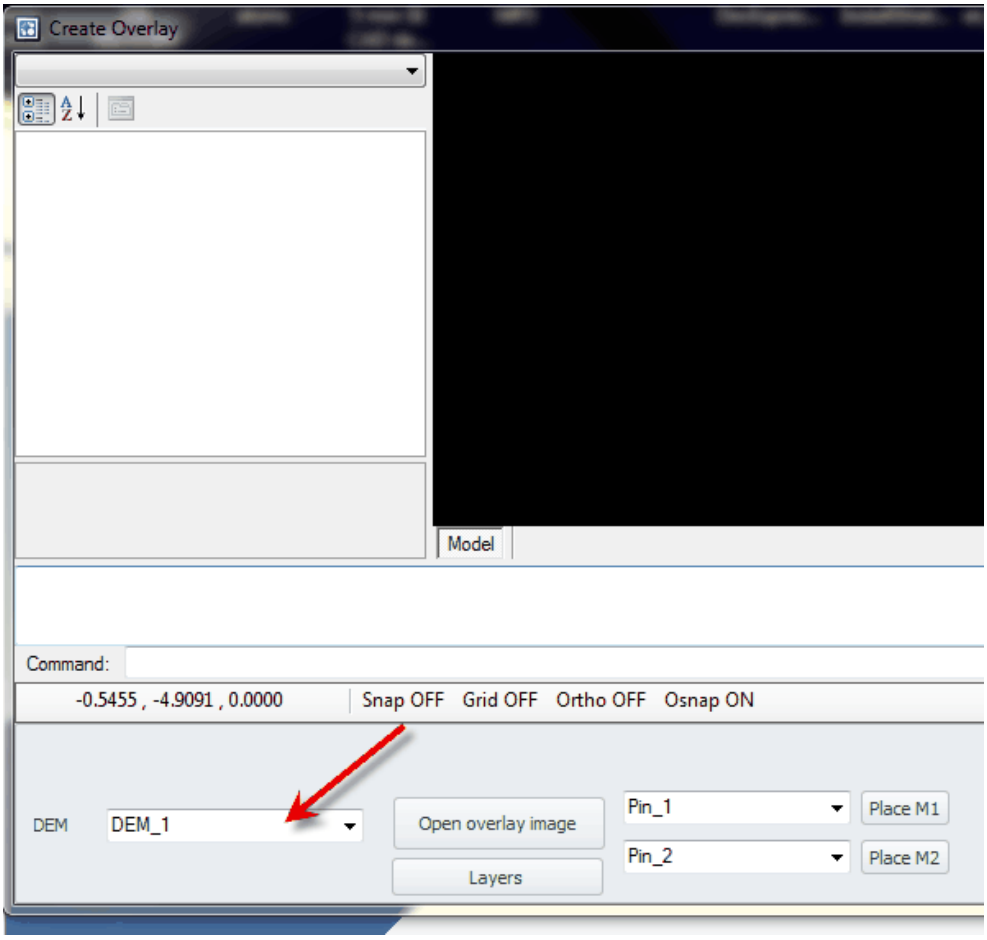
3. Select the DEM to be overlaid from the drop down list.



4. Click [Open overlay image] and select the image file.

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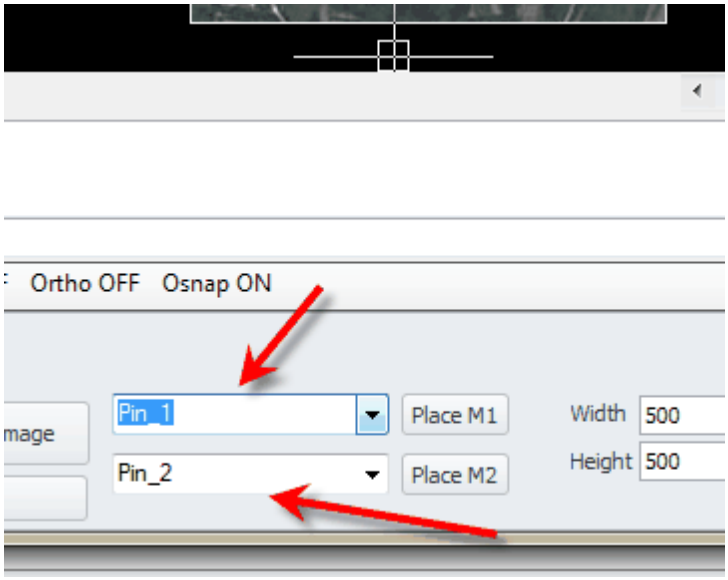
5. Select the first and second pin to be used as M1 and M2 markers, respectively, from the drop down list.



5. Click [Place M1], and click at the corresponding location on the image.

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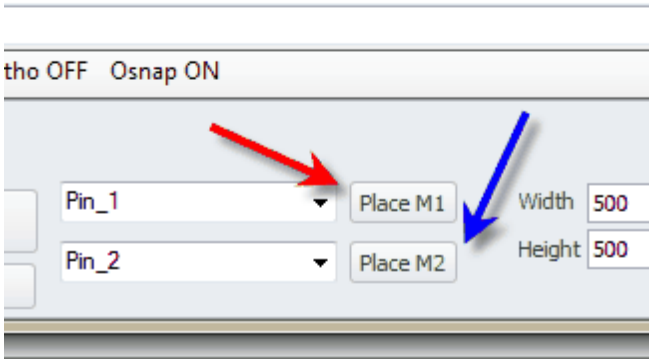
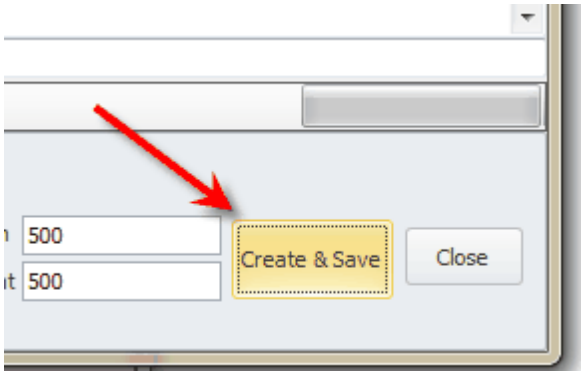
6. Click [Place M2], and click at the corresponding location on the image.



7. Click [Create and Save] to save the resultant DOM as bitmap file.



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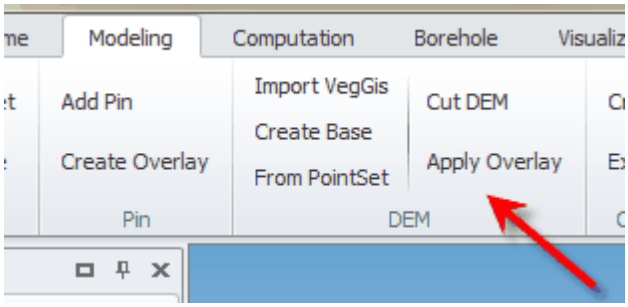
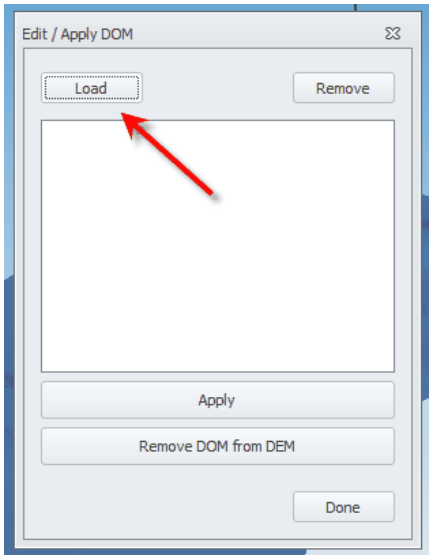
8.1.2.6 Apply DOM

1. Click Modeling > DEM > Apply Overlay.



2. Click [Load].



3. Choose the desired BMP image file, click [Open].

4. Select the DOM from the list.

5. Select the DEM in scene, and click [Apply].

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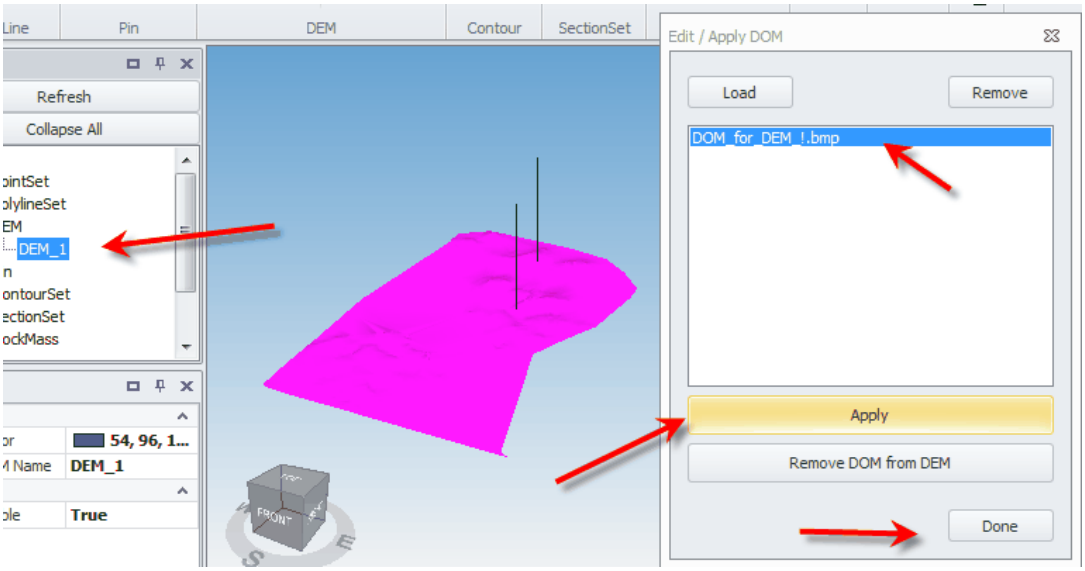


6. Click [Done] to close the tool box.

Note: DOM is only visible when the Display Mode is set to "Rendered" 26***.***

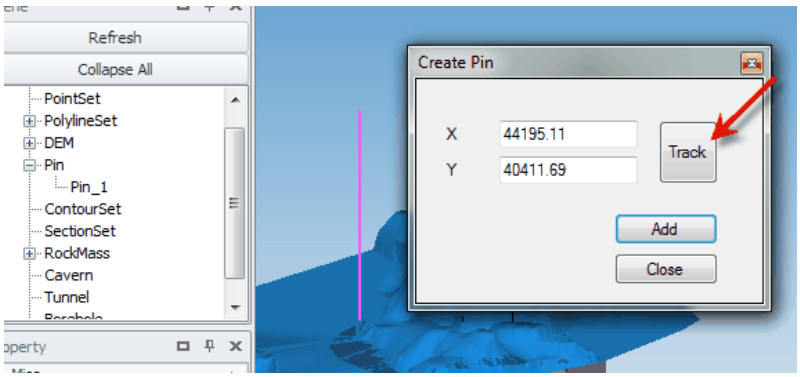
8.1.3 Pin

8.1.3.1 Create Pin

1. Click Modeling > Pin > Add Pin.

2. Click [Track], and click at the desired location in the Scene.

3. Confirm the X and Y values, click [Add] to create a new Pin.



4. Click [Close] to close the tool box.

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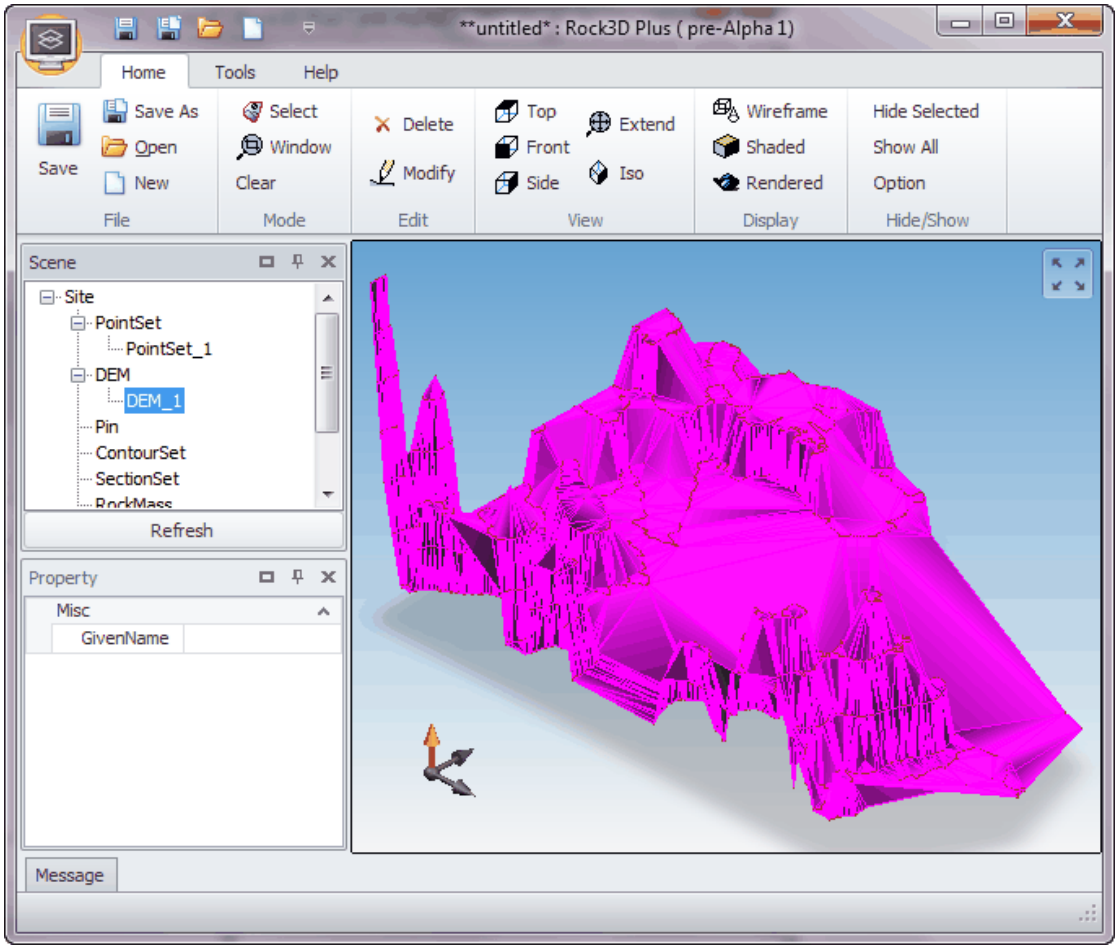
8.1.3.2 Create Overlay

See DEM:Create DOM (Overlay) 54

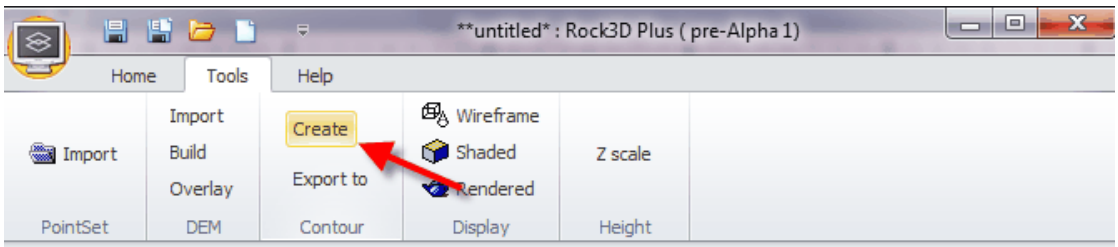
8.1.4 ContourSet

8.1.4.1 Create ContourSet

1. Select the DEM



2. Click Modeling > Contour > Create



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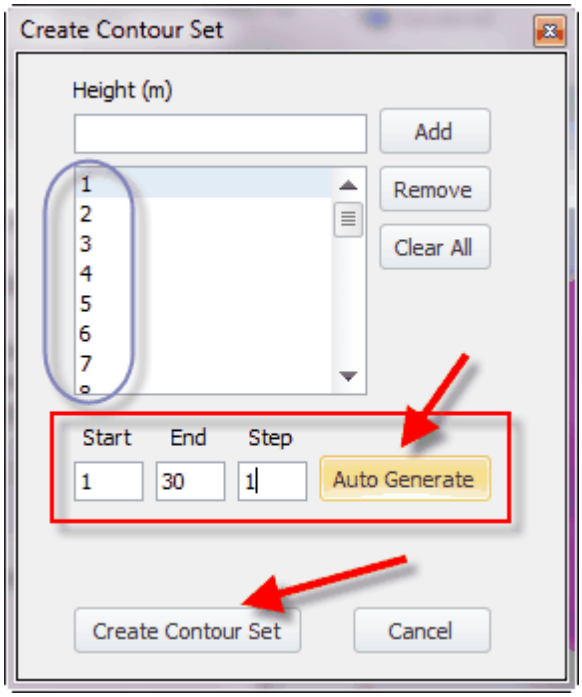
3. Enter the Starting, Ending and Interval of contour line height and click [Auto Generate] to populate the Heights (in meter) List, and click [Create ContourSet].



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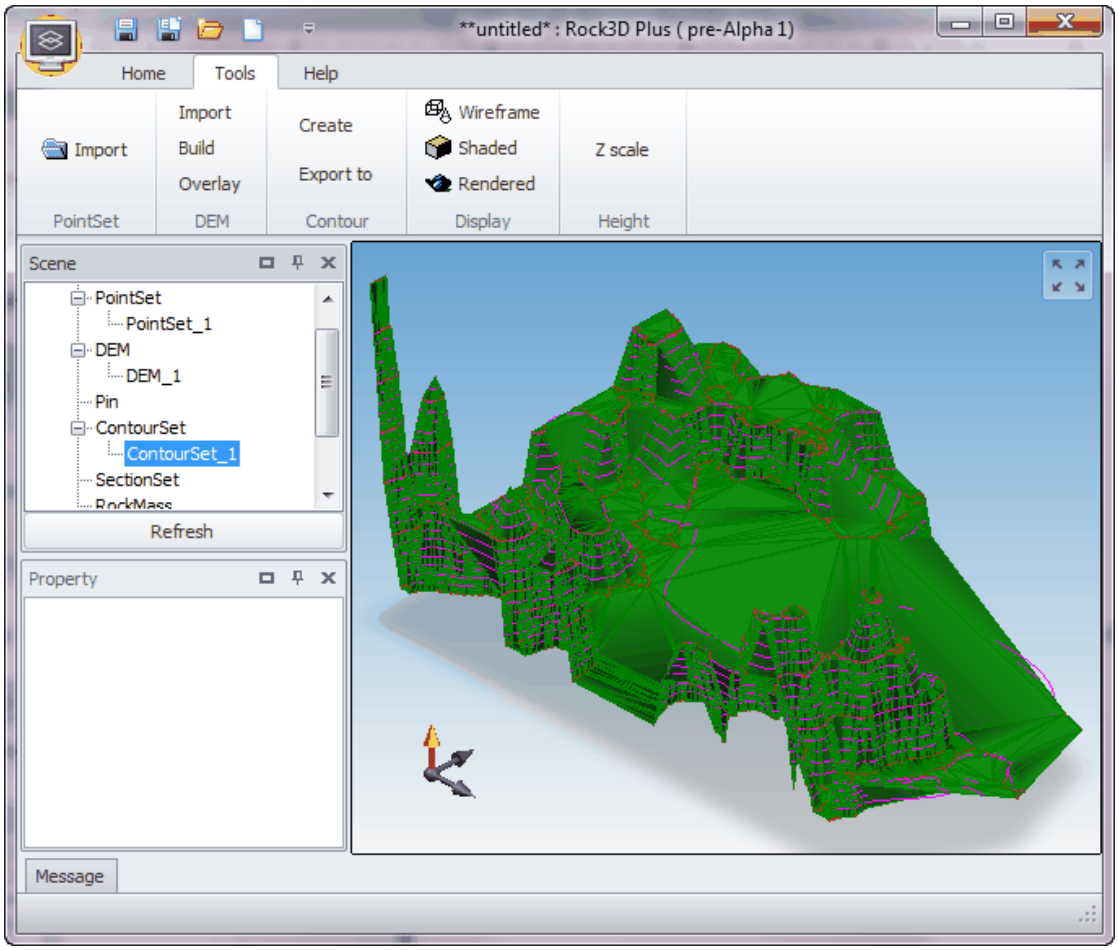
4. The new ContourSet is added to the Entity List and displayed in Work Space.



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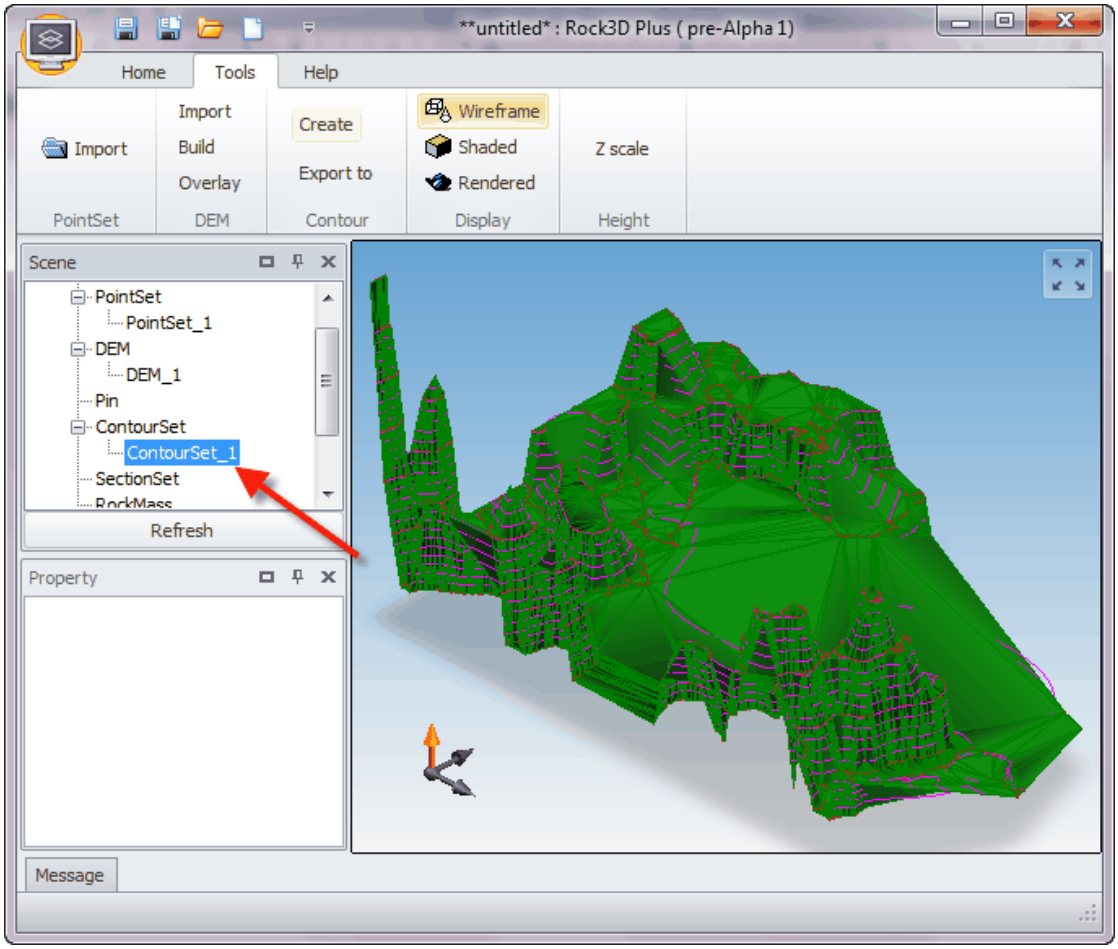
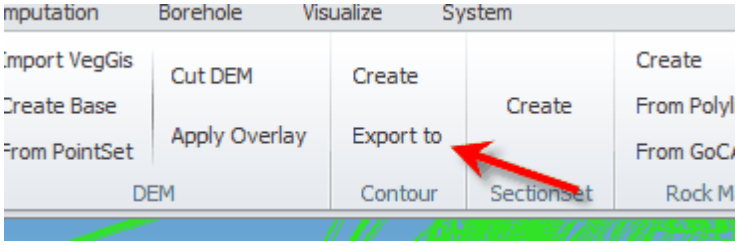
8.1.4.2 Export ContourSet to DXF file

1. Select the ContourSet(s) to be exported



2. Click Modeling > Contour > Export to



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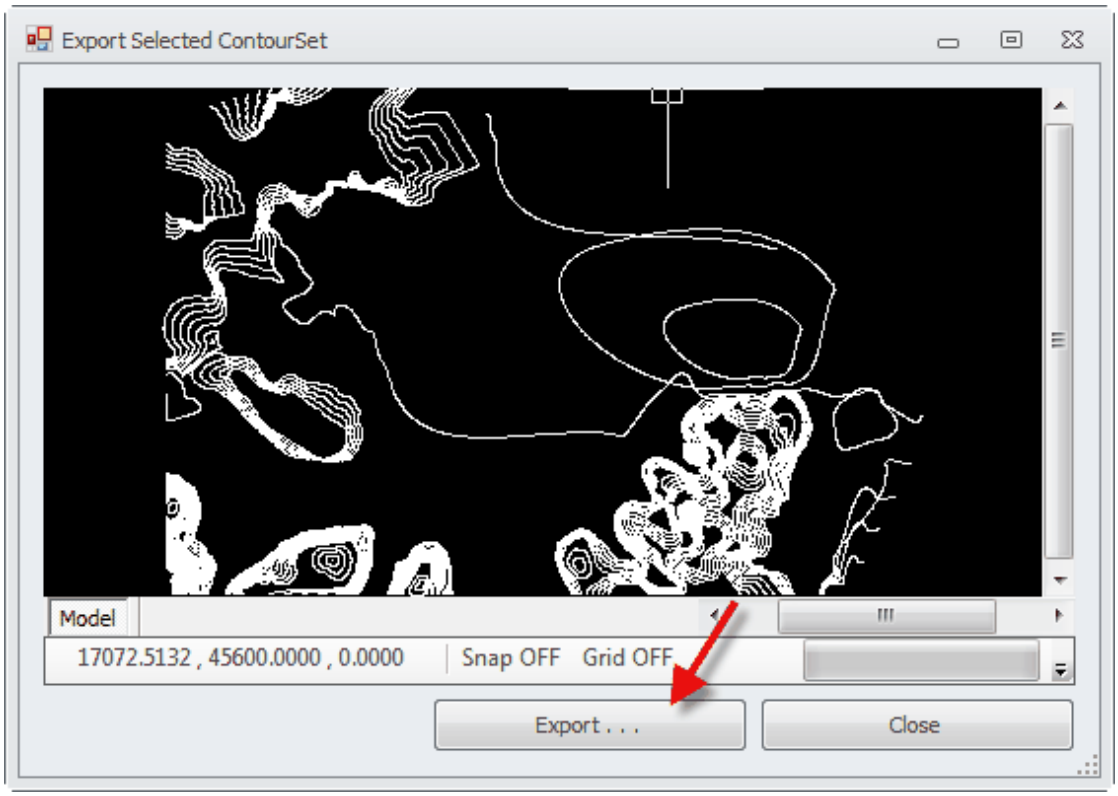
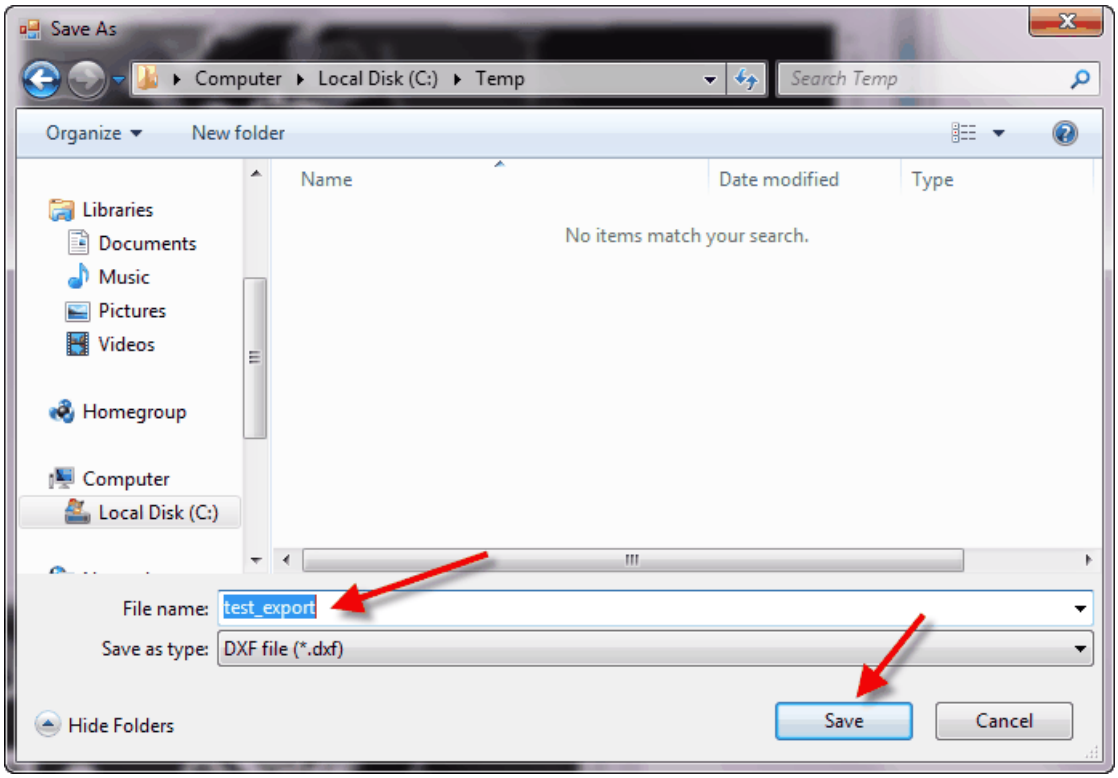
3. Click [Export ...], specify the file name, and click [Save], click [Close] to close the export dialog.





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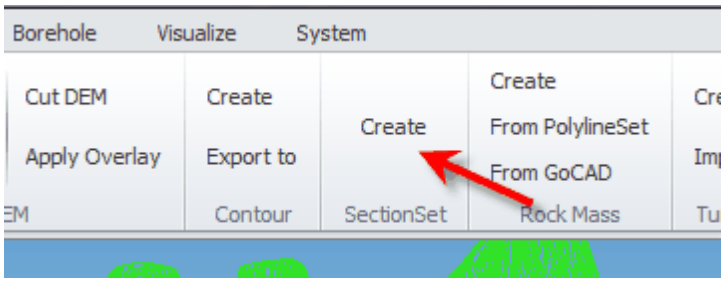
8.1.5 SectionSet

8.1.5.1 Create SectionSet

1. Click Modeling > SectionSet > Create



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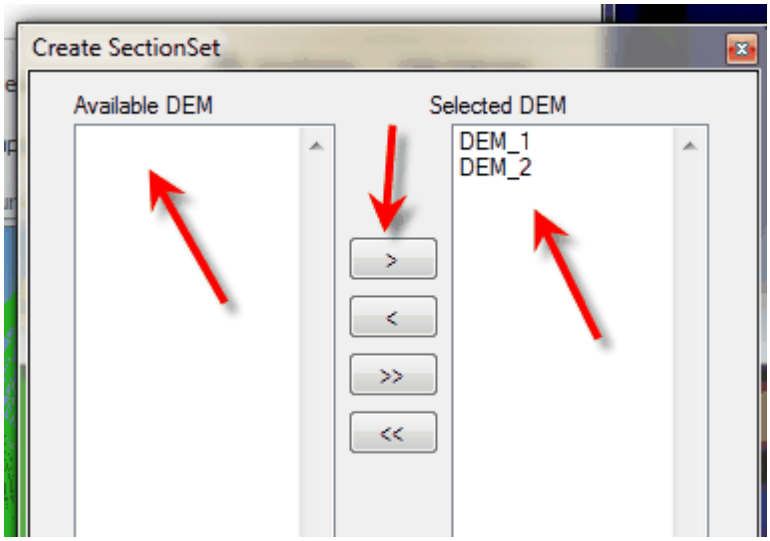
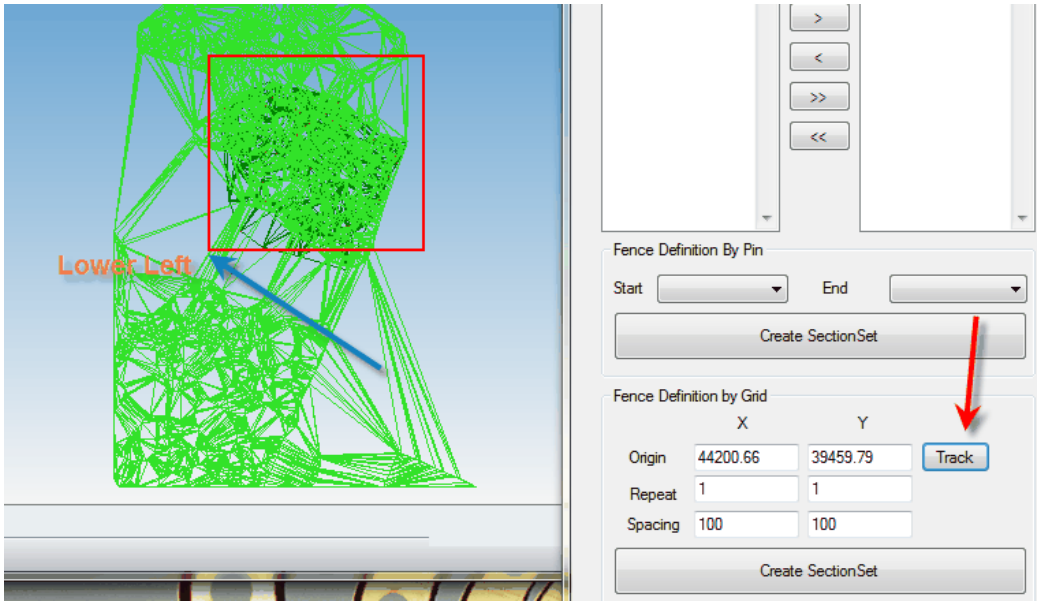
2. Select each DEM from "Available DEM" list and click [>] to add relevant DEMs (from top most to the bottom most) into the Selected DEM list.



3. Click [Track] button and click at the lower left corner of the SectionSet and click to grab the X,Y coordinates into "Origin" input box.



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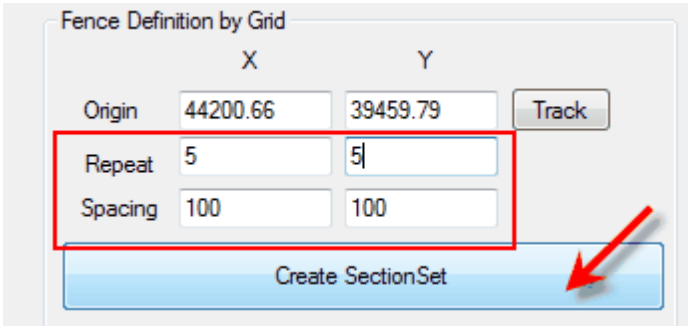
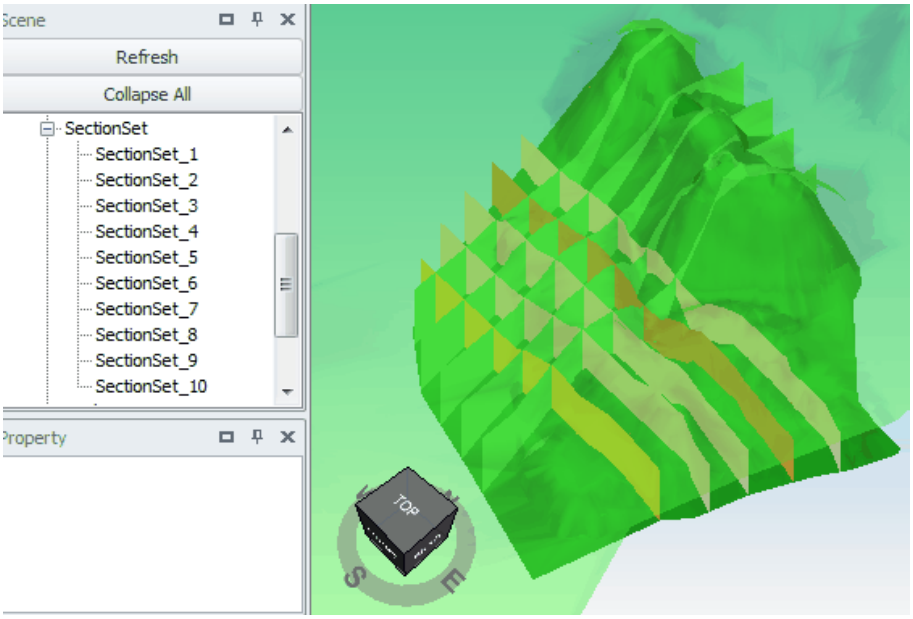
4. Enter number of repetition and spacing between each Section and click [Create SectionSet].



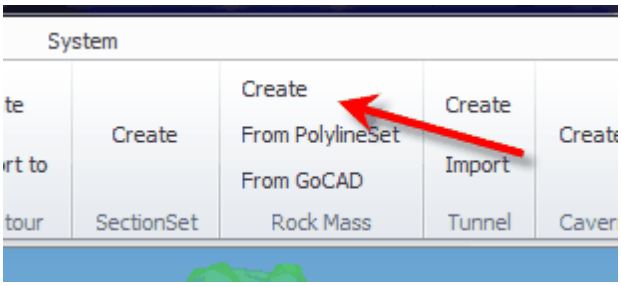
5. New SectionSets will be added. Click [Done] to close the tool box.



8.1.6 RockMass

8.1.6.1 Create

1. Click Modeling > Rock Mass > Create.



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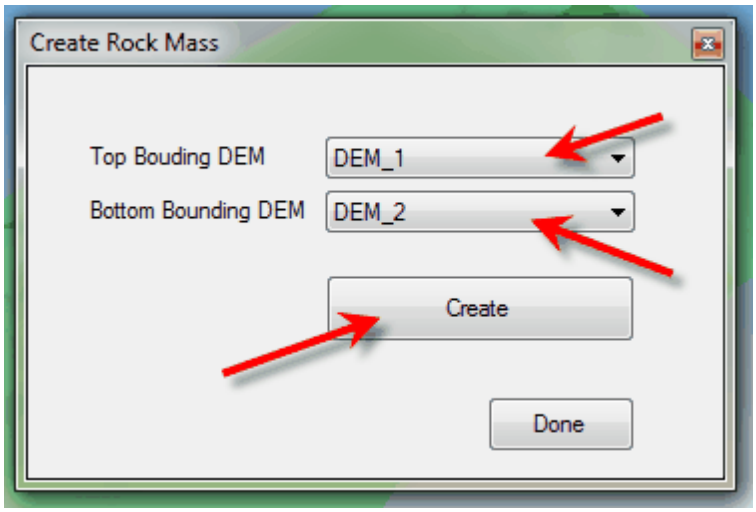
2. Select the top and bottom bounding DEM from the drop down box, and click [Create].



3. Click [Done] to close the tool box.

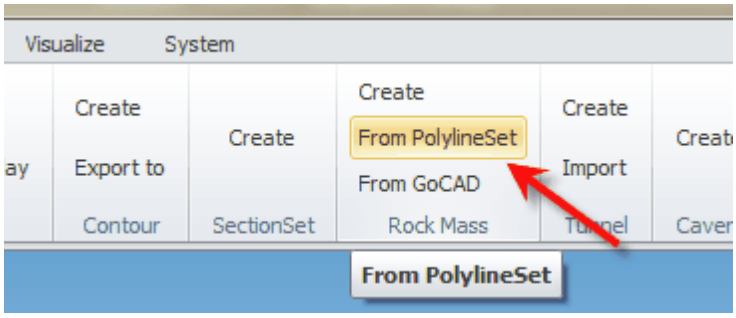
8.1.6.2 From PolylineSet

3DROCK+ can create new Rock Mass by inferring a solid based on series of closed polylines bounding the shape of the Rock Mass. The quality and end result depends on the resolutions and conformity of the polylines' vertexes.

All the polylines of the same rock mass must be imported from DXF file in a single batch (i.e. stored under one PolylineSet).

1. Import the PolylineSet[45] of which all the polylines bounding the Rock Mass is included.

2. Click Modeling > RockMass > From PolylineSet.



3. Select the PolylineSet from the drop down list, and click [Create].

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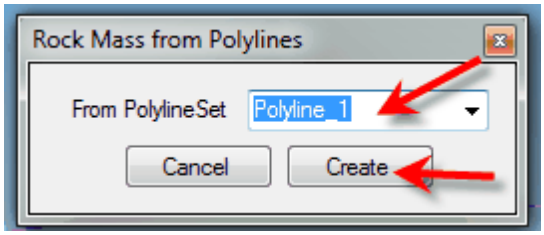
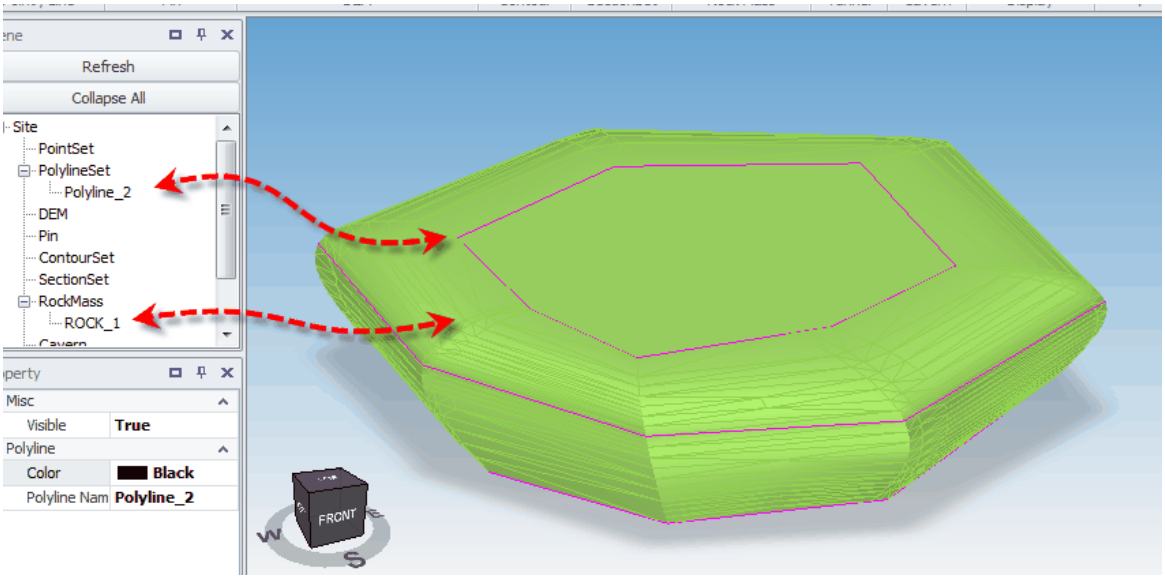


4. A new Rock Mass will be added to the Scene.



8.1.6.3 From GoCAD

3DROCK+ can import GoCAD object saved as 3DPolyFace type via DXF file.

1. Click Modeling > Rock Mass > From GoCAD.

2. Click [Open DXF], select and open the DXF file containing GoCAD 3D object.

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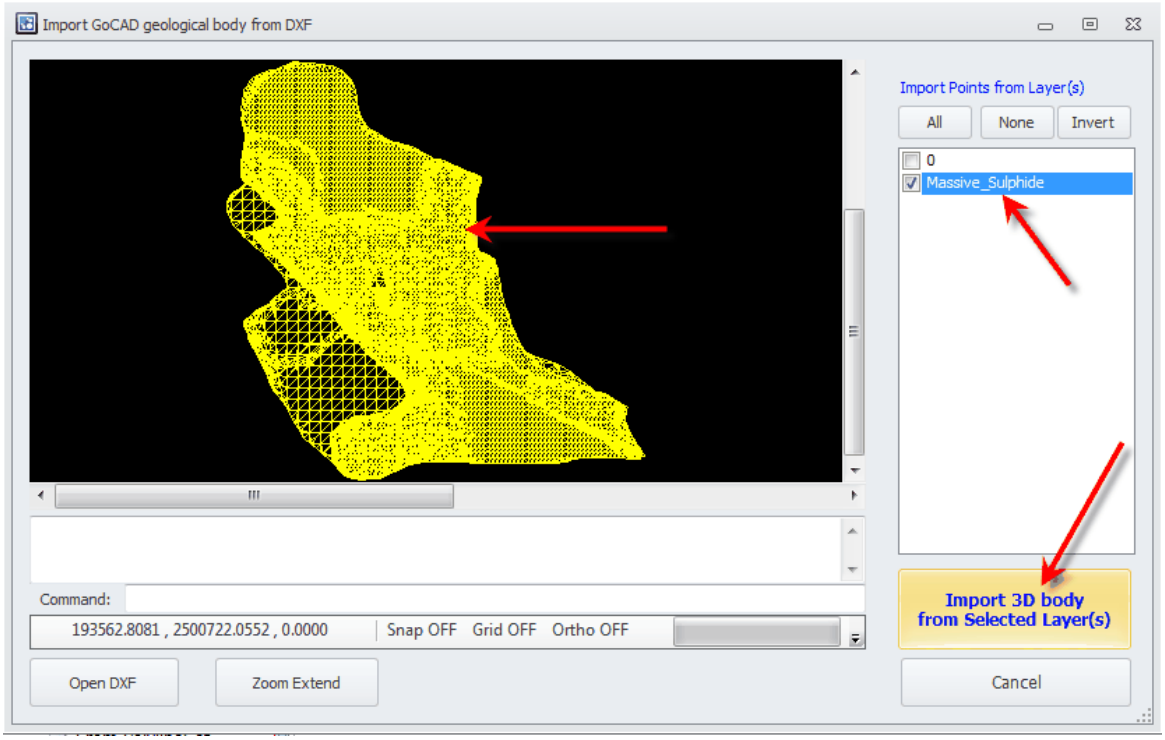
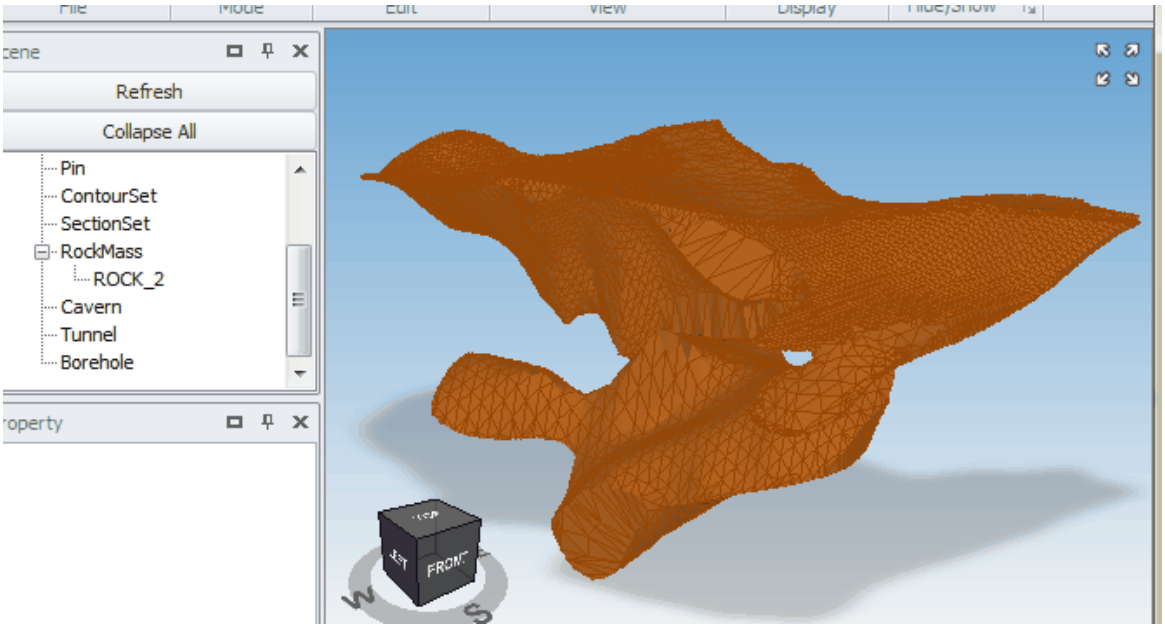
3. Click at the layer that contains the 3D object. Click [Import 3D body from Selected Layer(s)].



4. A new Rock Mass will be added to the Scene.



Note: Importing 3D object from GoCAD is an computational intensive process.

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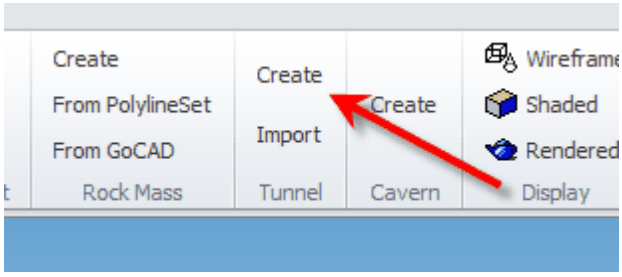
8.1.7 Tunnel

8.1.7.1 Create

User can create new Tunnel by "sweeping" a *cross section* (as a closed polyline) along a *build path*.

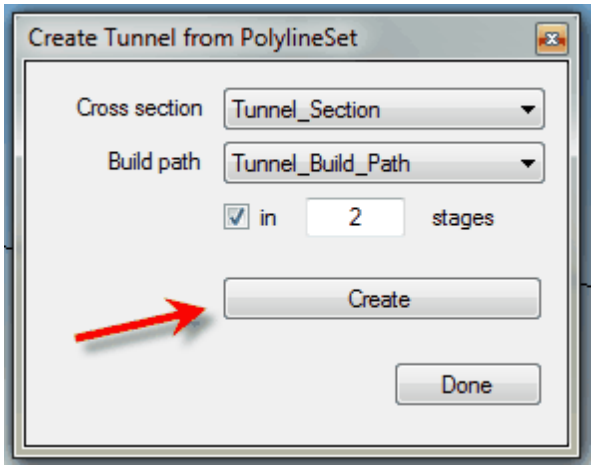
Both the cross seciton and build path have to be imported as PolylineSet[45] .

1. Select Modeling > Tunnel > Create



2. Select the PolylineSet for both ***Cross section*** and ***Build path***.

3. If, necessary, tick the check box and specify the number of stages the new Tunnel should be built.



4. Click [Create]. A new Tunnel (with multiple segments, if specified) will be added to the Scene.

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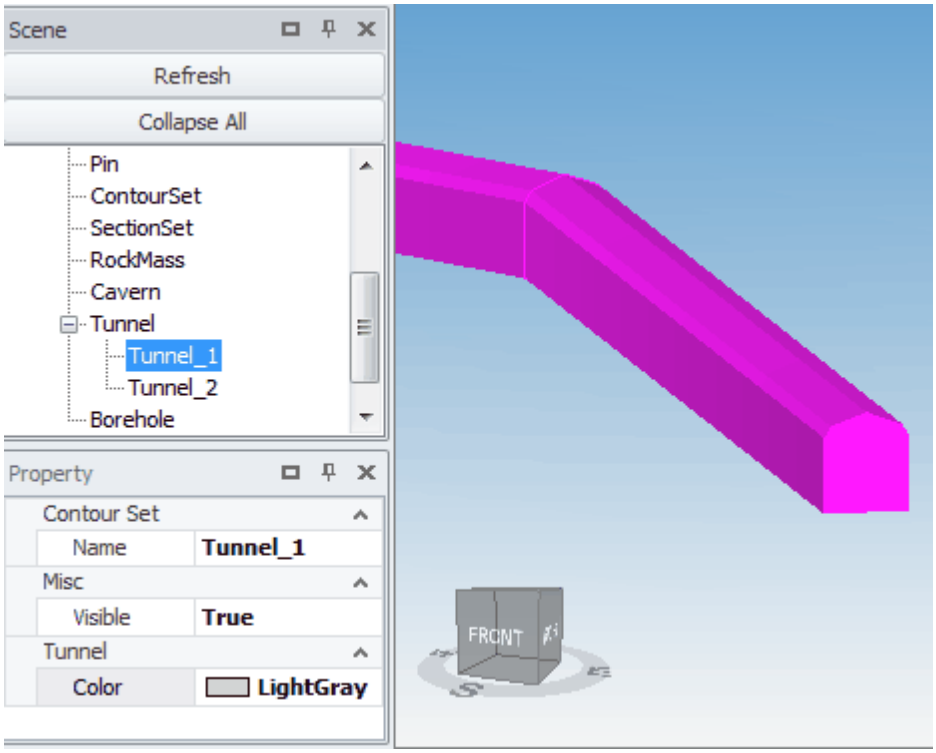

5. Click [Done] to close the tool box.

8.1.7.2 Import

User can also import 3D tunnel object from 3rd-party software like AutoDesk Inventory using binary *.STL file.

1. Click Modeling > Tunnel > Import.

2. Select the .STL file and click [Open].

3. A new Tunnel object will be added to Scene.

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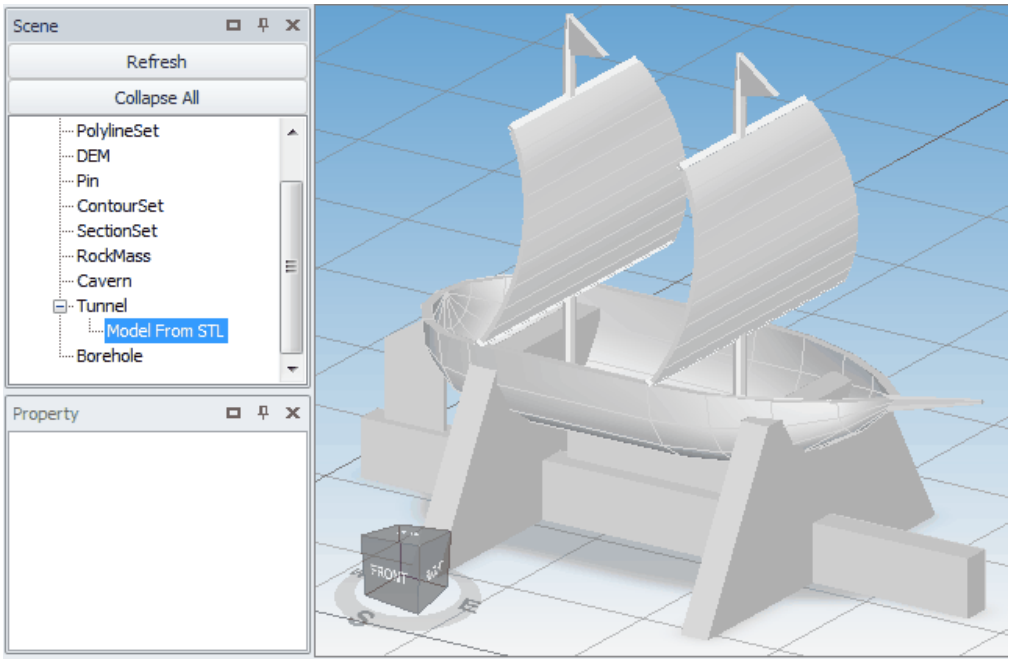


8.1.8 Cavern

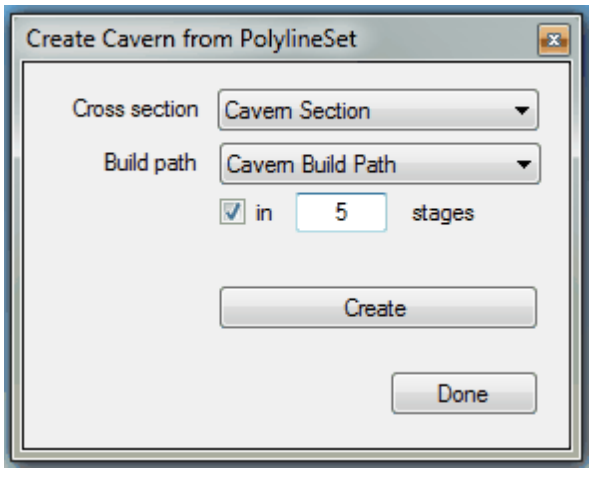
8.1.8.1 Create

User can create new Cavern by "sweeping" a *cross section* (as a closed polyline) along a *build path*.

Both the cross section and build path have to be imported as PolylineSet[45] .

1. Click Modeling > Cavern > Create.

2. Select the PolylinSet for both the *Cross section* and the *Build path* from the drop down list.



3. Tick and specify the number of stages a new cavern shall be built, if necessary.

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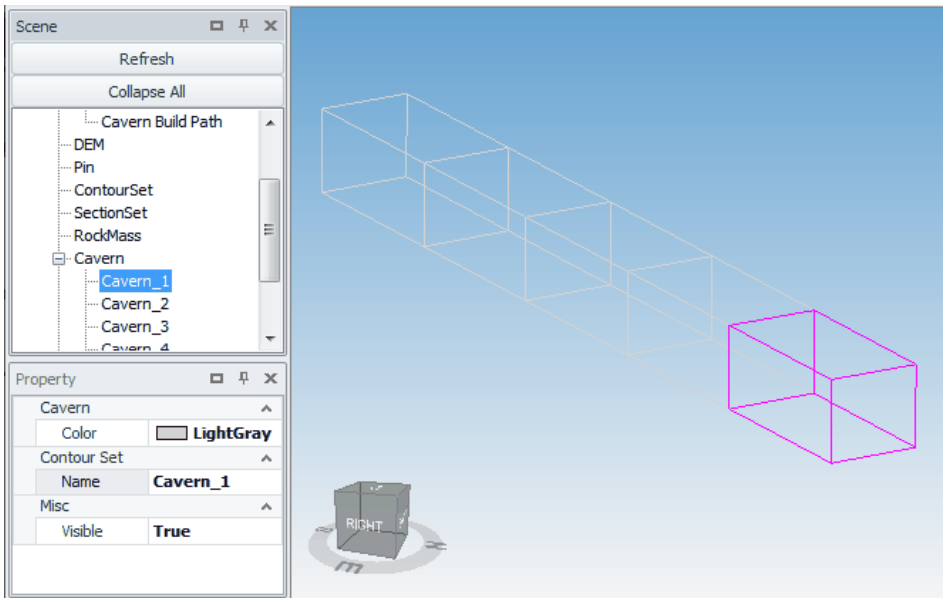
4. Click [Create]. A new Cavern object will be added to the Scene.



5. Click [Done] to close the tool box.

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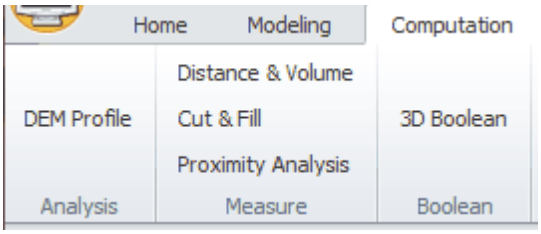
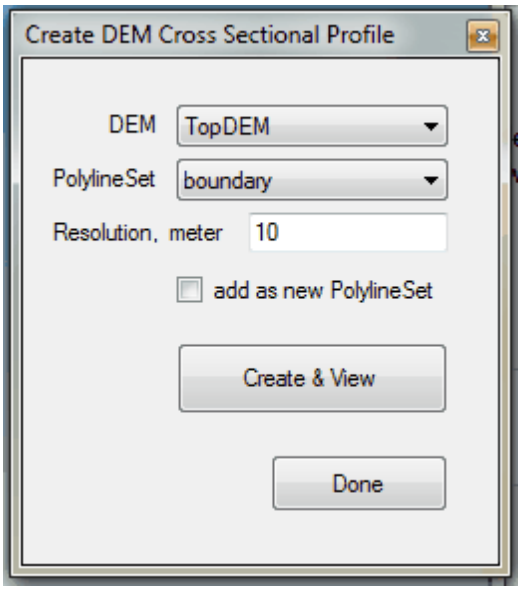
8.2 Computation



8.2.1 Analysis

8.2.1.1 DEM Profile

1. Click Computation > Analysis > DEM Profile
2. Select the DEM layer of which the profile is to be calculated.
3. Select the PolylineSet which defines the cutting path.
4. Enter the resolution (interval between sampling points) in meter.
5. Tick "add as new PolylineSet" should a new polyline is to be added along the profile cutting path.



6. Click [Create & View] to display the DEM profile.

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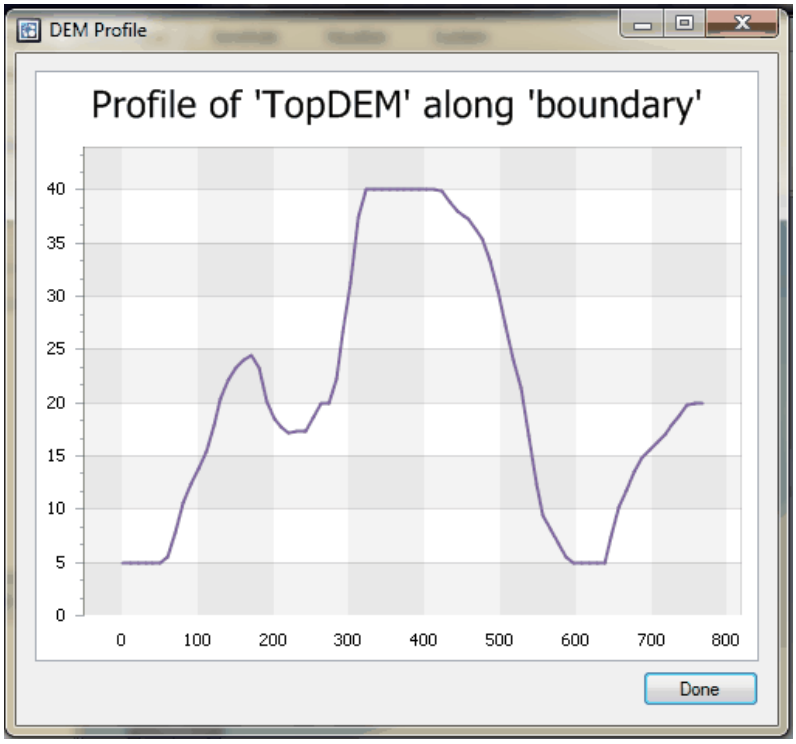
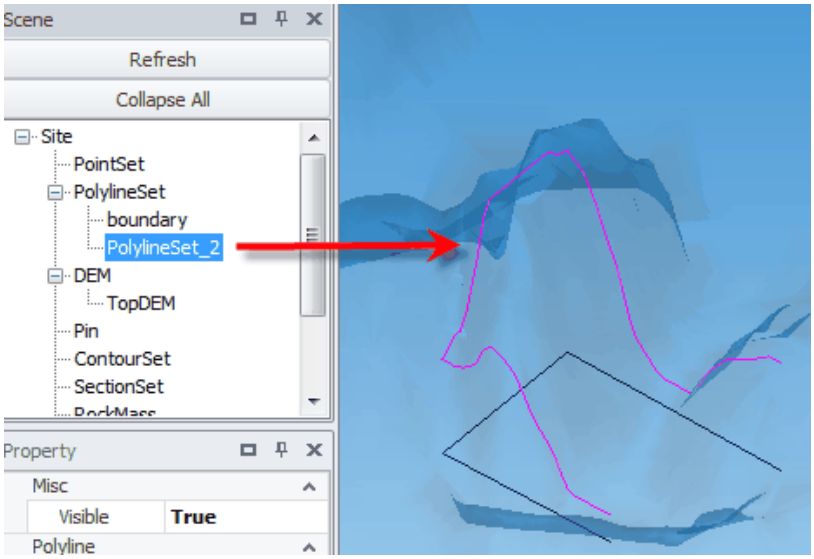


7. A new PolylineSet will be added to the Scene if Step 5 is done.



8. Click [Done] to close.

8.2.2 Measure

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8.2.2.1 Distance & Volume

User can measure the

a) distance between two objects (any 2D or 3D objects),

b) surface area of DEM (i.e. 2D surface object), and

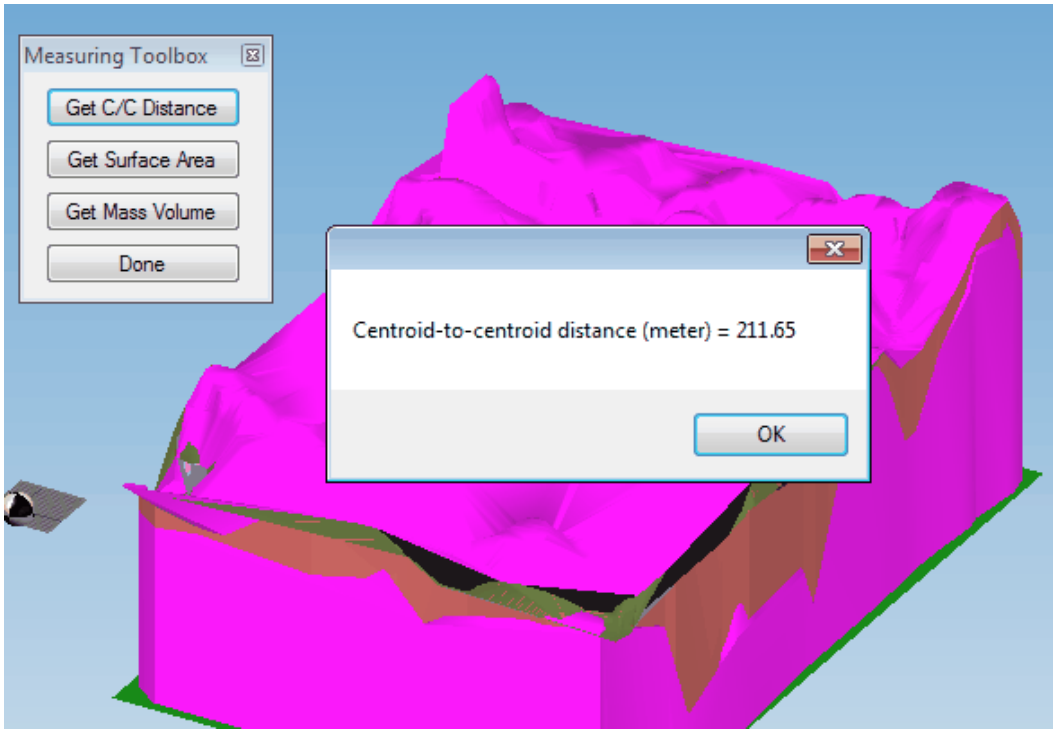
c) total volume of Rock Mass, Tunnel and Cavern (i.e. 3D objects).

Distance

1. Click Computation > Measure > Distance & Volume

2. Select two objects[31] from the Scene.

3. Click [Get C/C Distance]. The centroid-to-centroid distance of the selected objects will be displayed.



Surface Area

1. Click Computation > Measure > Distance & Volume

2. Select a DEM[31].

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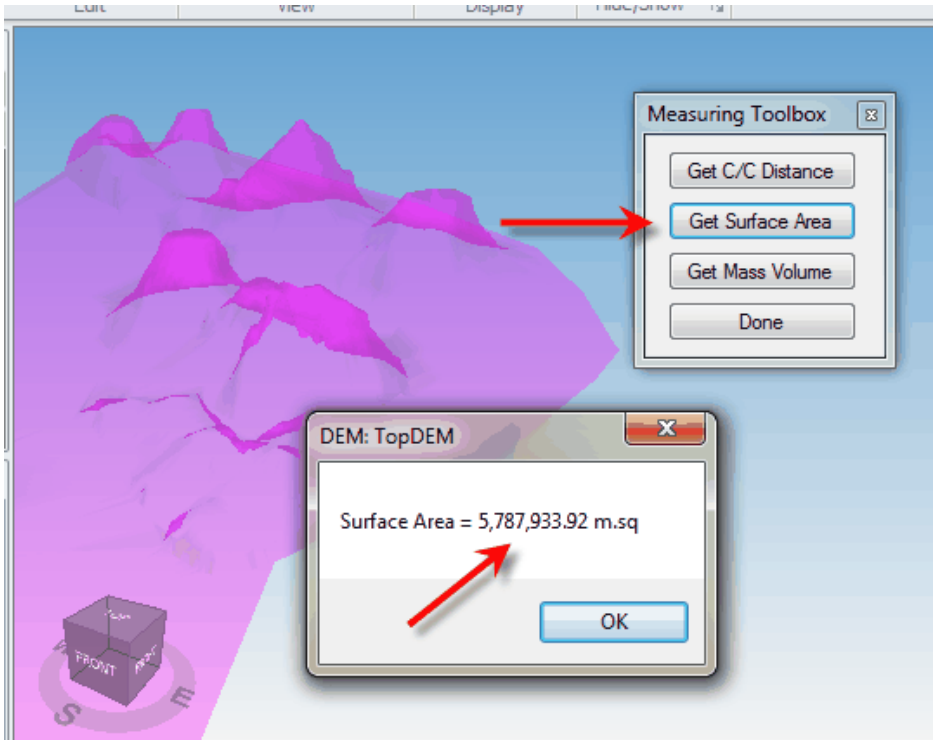
3. Click [Get Surface Area]. The total surface area of the selected DEM will be displayed.



Volume

1. Click Computation > Measure > Distance & Volume

2. Select a *Rock Mass*, *Tunnel* **OR** *Cavern*

3. Click [Get Mass Volume]. The total volume of the selected 3D object will be displayed.

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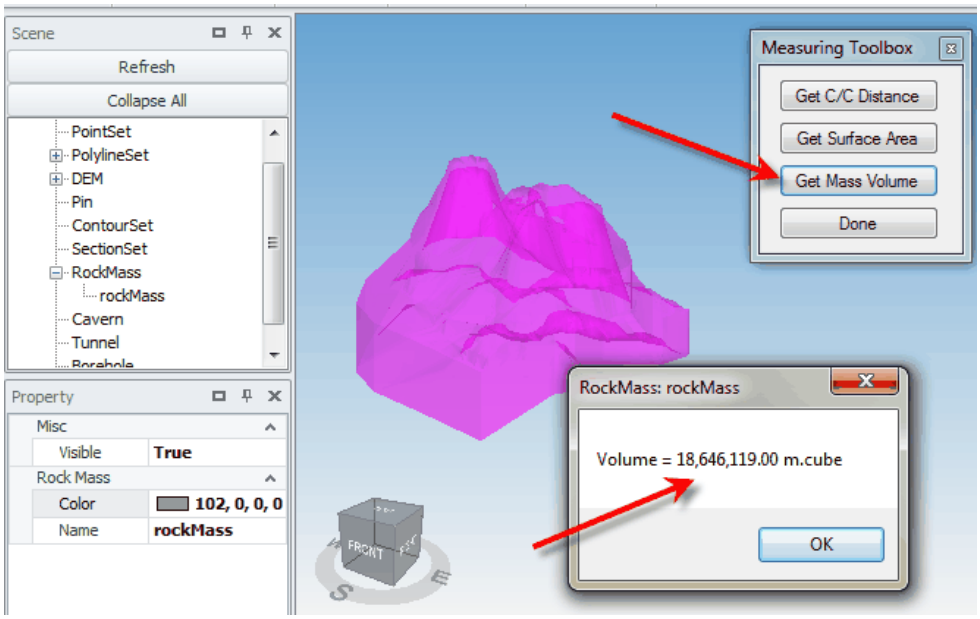

8.2.2.2 Cut & Fill

1. Select Computation > Measure > Cut & Fill.

2. Select the desired DEM from the drop down list.

3. Select the type of measurement needed, i.e. Cut or Fill.

4. Specify the reference datum level. User may use the maximum and minimum of the selected DEM as a guide.

5. Click [Get Volume]. The total Cut (or Fill) volume will be displayed.

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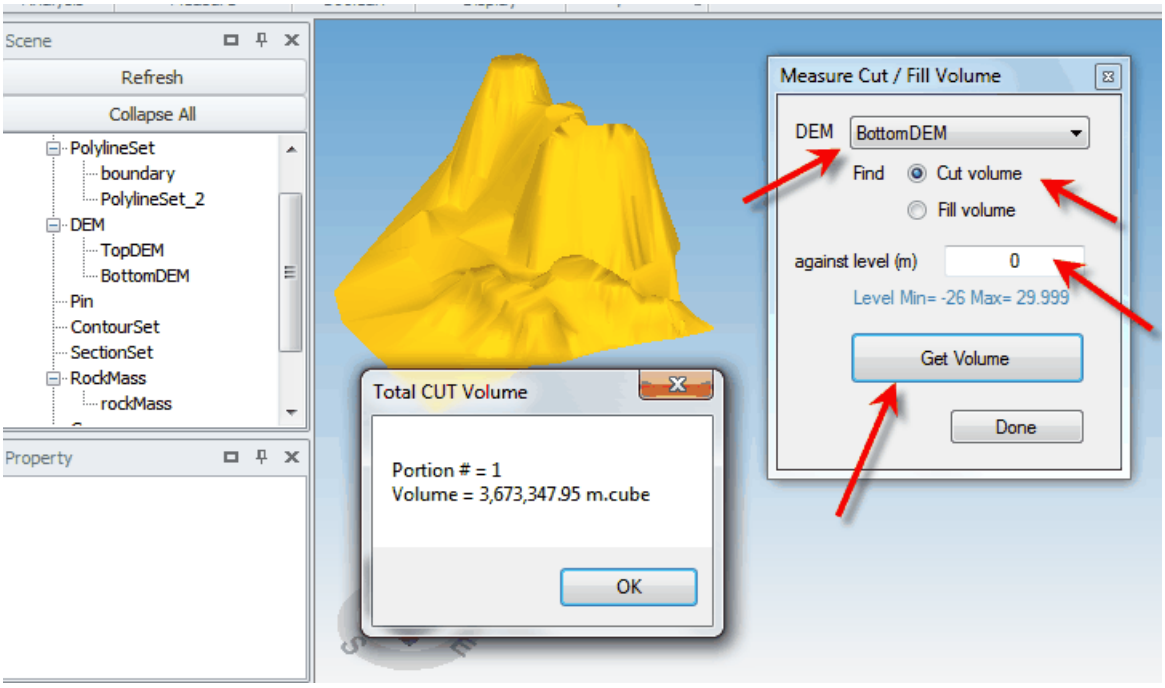

6. Click [Done] to close the tool box.

8.2.2.3 Proximity Analysis

User may get a list of PolylineSet, Rock Mass, Tunnel and/or Cavern contained within another buffer object made of 3D entity (i.e. Rock Mass, Tunnel or Cavern).

1. Click Computation > Measurement > Proximity Analysis.

2. Select the buffer object from the drop down list.

3. Tick "include partially bounded" to instruct program detect object that are also partially contained within the buffer object.

4. Click [Query], and all the detected objects will be listed in the Result list box.

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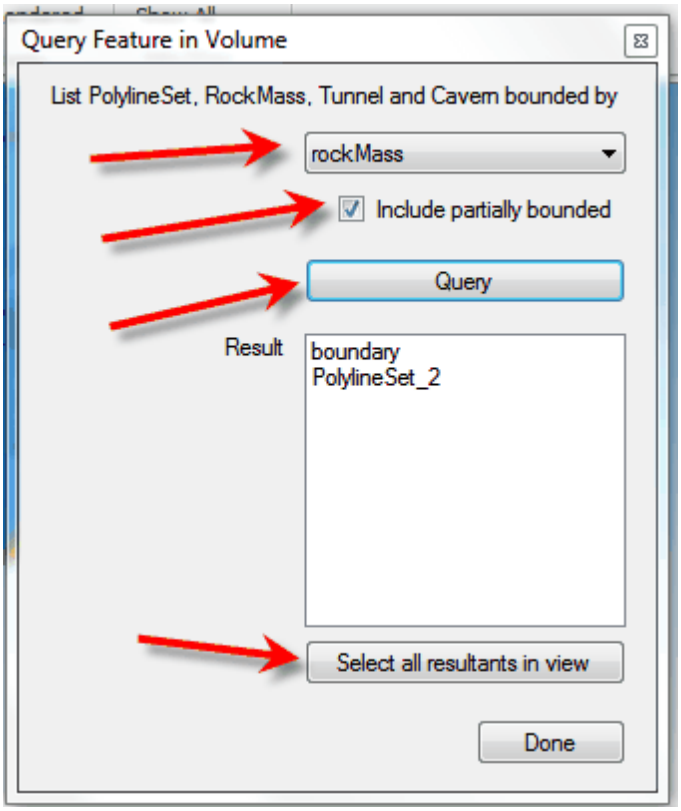

5. Click [Select all resultants in view] to select all the entity in the Work Space.

Note: This is a time consuming calculation for large buffer object of Scene with many entities.

8.2.3 Boolean

8.2.3.1 3D Boolean

1. Click Computation > Boolean > 3D Boolean.

2. Select and 1st and 2nd Object for Boolean operation.

3. Select the type of Boolean operation.

4. Select the type of object to be created.

5. Click [Create]. A new type of object (as selected in Step 4) will be added to the Scene.

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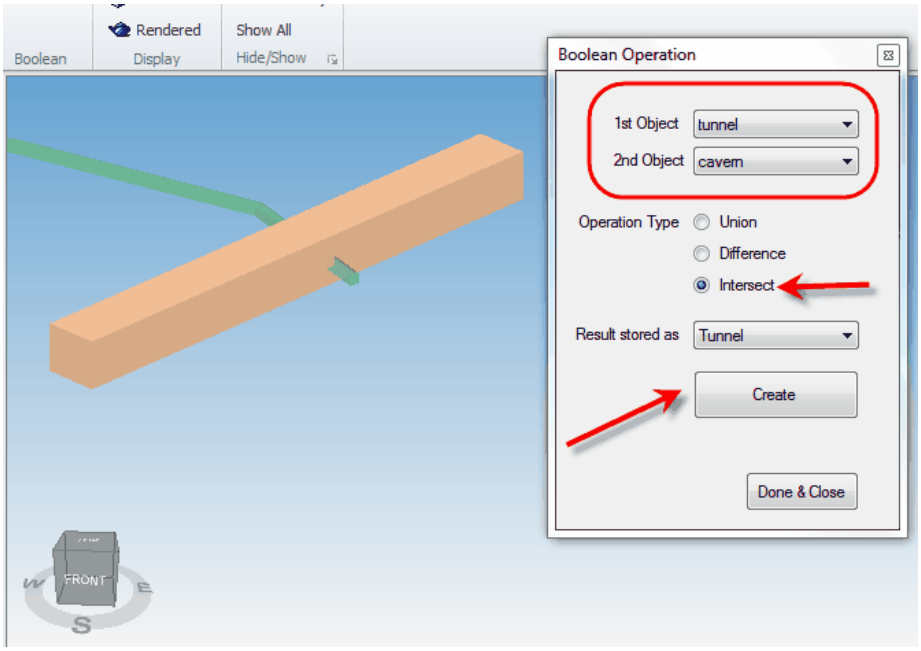

6. Click [Done & Close] to close the tool box.

Note: The resultant is affected by the order of the 1st and 2nd object as selected in Step 2.

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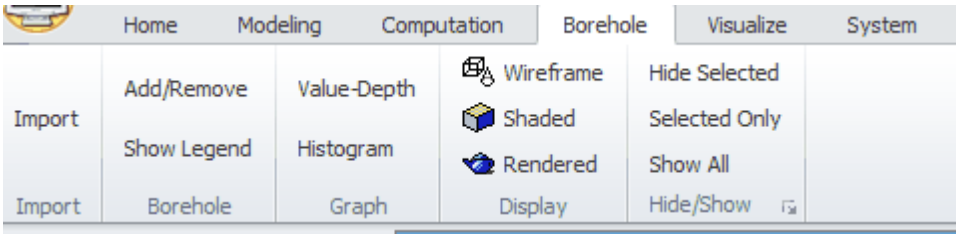
8.3 Borehole



8.3.1 Import

The Borehole data must be imported before it can be visualized, analyzed and plotted in 3DROCK+.

8.3.1.1 Import

1. Click Borehole > Import > Import.

2. Click ***[. . .]***, and select the *.MDB file(s). [Hint: To select multiple files in the Open File Dialog, hold [Ctrl] key and click on the file names].

3. Click [Open], all the selected files are listed in the list box. Click [Connect] to open the database files.

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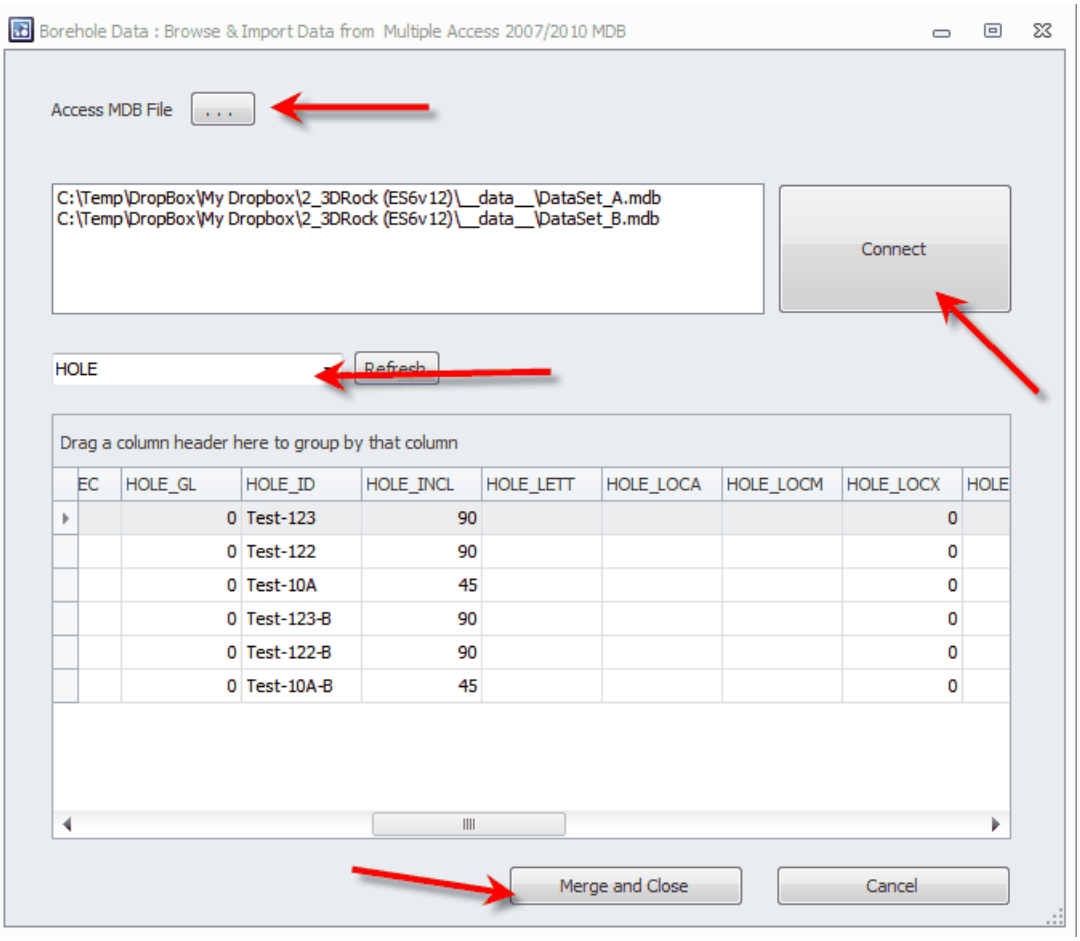
4. You may select different table from the drop down list to preview the merged records.


Borehole Data : Browse & Import Data from Multiple Access 2007/2010 MDB
Access MDB File
. . .
C:\Temp\DropBox\My Dropbox\2_3DRock (ES6v12)__data__\DataSet_A.mdb
C:\Temp\DropBox\My Dropbox\2_3DRock (ES6v12)__data__\DataSet_B.mdb
Connect
HOLE
Refresh
Drag a column header here to group by that column
EC HOLE_GL HOLE_ID HOLE_INCL HOLE_LETT HOLE_LOCA HOLE_LOCM HOLE_LOCX HOLE
0 Test-123 90 0
0 Test-122 90 0
0 Test-10A 45 0
0 Test-123-B 90 0
0 Test-122-B 90 0
0 Test-10A-B 45 0
Merge and Close
Cancel

5. Click [Merge and Close] to import the tables and records.

Note:

A] Database Engine on Client Machine

3DROCK+ imports and visualizes AGS(SG) Borehole data from Microsoft Access Database (*.MDB) via

a) Microsoft JET ODBC engine (on 32-bit Windows Operating System), or
b) Microsoft Access version 12 Engine (on 64-bit Windows Operating System).

The underlying data driver/engine has to be pre-installed and configured on the client system before data import can be performed.

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B] Purging of Records

The imported data are stored in "***boreholes.mdb***" under the working folder of the model. To remove all the records, simply delete this file.

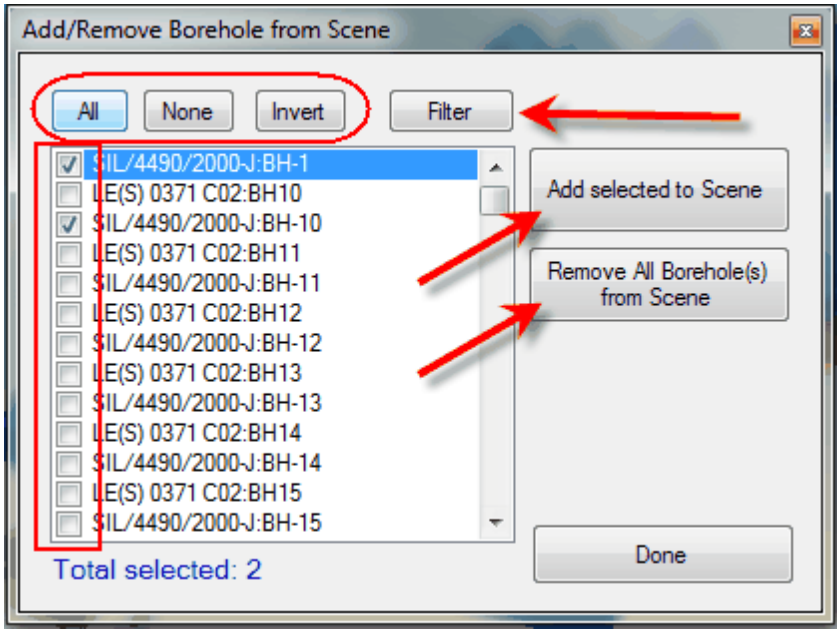
8.3.2 Borehole

8.3.2.1 Add/Remove

After Importing borehole records from Access Database, user can select and add borehole(s) into the Scene for visualization.

1. Click Borehole > Borehole > Add/Remove

2. Select the desired Borehole by checking/unchecking the item in the list box.



3. Alternatively, click the [Filter] button to call up the Select Record tool box[90] for advanced selection.

4. Click [Add selected to Scene] to add the selected Borehole into the Scene.

5. To remove all the existing Boreholes from the Scene, click [Remove All Borehole(s) from Scene].

6. Click [Done] to close the tool box.

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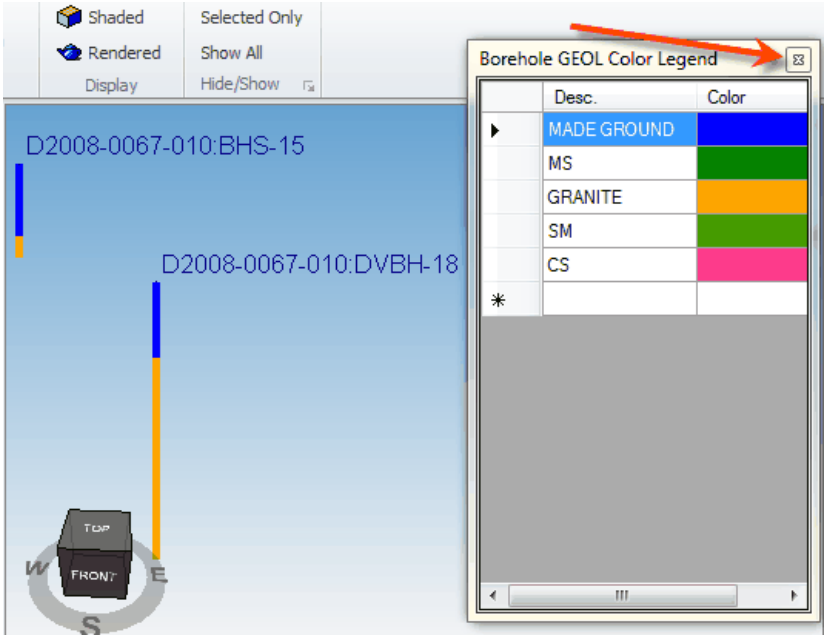
8.3.2.2 Show Legend

Boreholes are visualized in Scene based on either GEOL_GEO, GEOL_GEO2 or GEOL_GEO3 properties.

To show the Legend of the color used for each of the GEOL code as displayed,

1. Click Borehole > Borehole > Show Legend. The legend is displayed as a floating tool box.



2. Click [x] of the Legend box to close it.

Note: The above steps are to be repeated if the borehole display type is changed[93].

8.3.3 Graph

For any kind of property (i.e. *AGS(SG) table*), two types of graphing are available,

namely

a) Value-Depth Graph, and

b) Histogram

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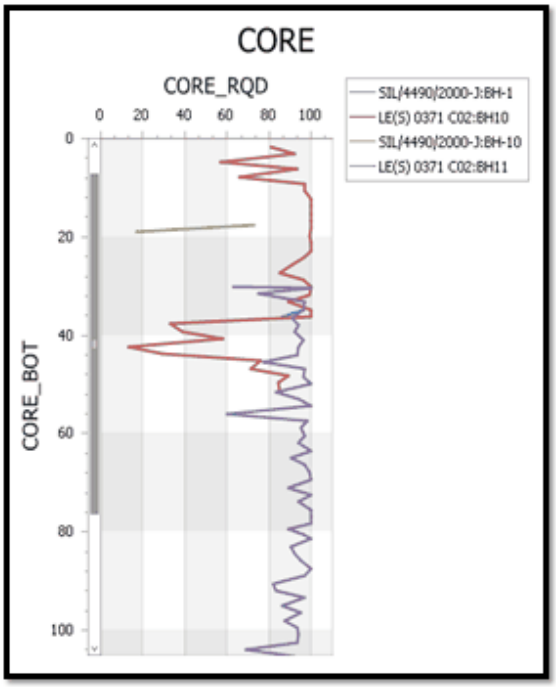
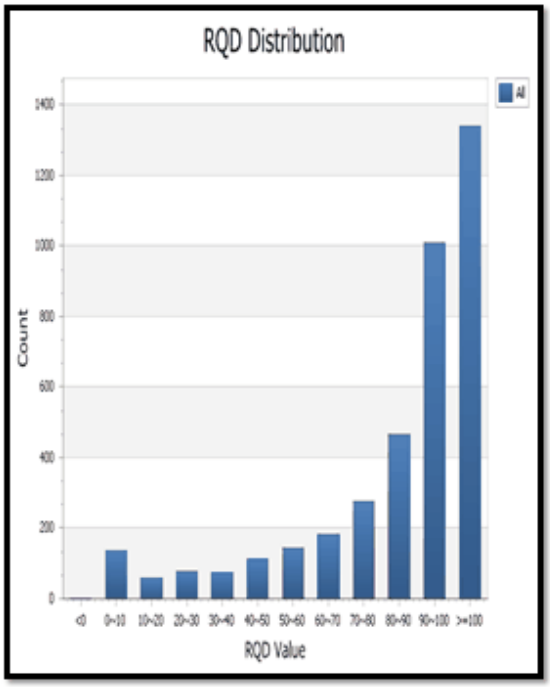


Value-Depth Graph



Histogram

8.3.3.1 Value-Depth

1. Click Borehole > Graph > Value-Depth
2. Select the desired records[90].
3. Select the Table from the drop down list.
4. Select the X-Axis and Y-Axis data.
5. Optional: Type the Title, and X- and Y-Axis label of the graph.

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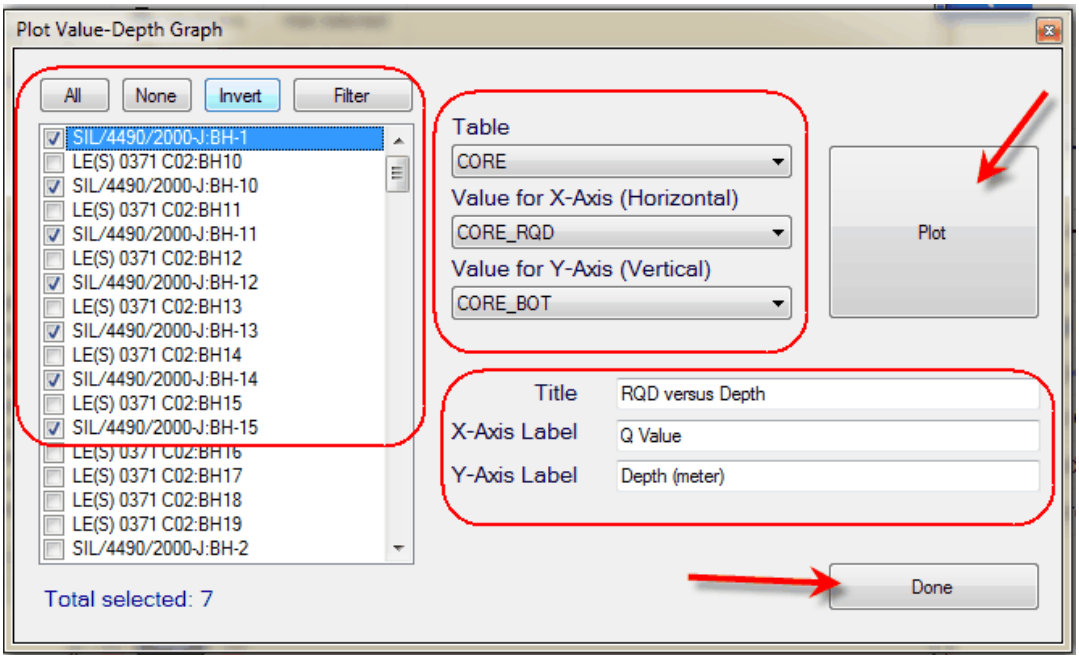
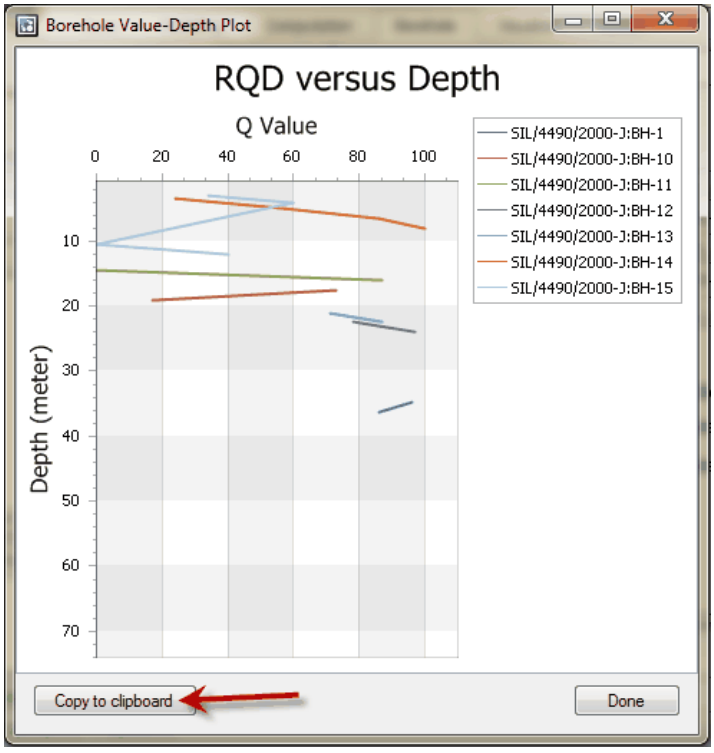


6. Click [Plot] to display the graph.



7. The displayed graph can be copied to clipboard by clicking [Copy to clipboard] and paste into compatible 3rd-party software (like MS Excel or MS Word) for reporting purposes.

8. Click [Done] to close the tool box.

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8.3.3.2 Histogram

1. Click Borehole > Graph > Histogram.

2. Select the desired records[90].

3. Select the Table from the drop down list.

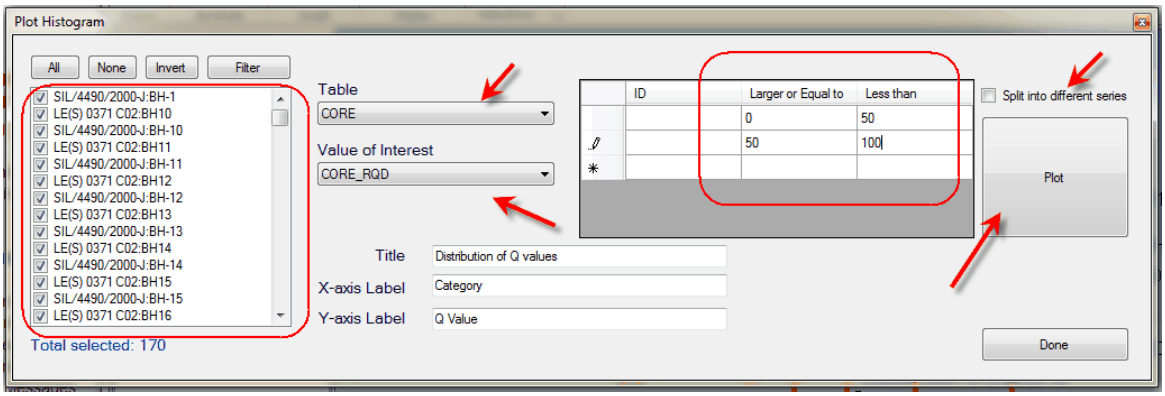
4. Select the Value of Interest (i.e. property) from the drop down list.

5. Specify the Intervals in the input table.

6. Tick "Split into different series" if needed.

7. Optional: Input the Title, X- and Y-Axis label.

8. Click [Plot] to display the histogram.



9. The displayed graph can be copied to clipboard by clicking [Copy to clipboard] and paste into compatible 3rd-party software (like MS Excel or MS Word) for reporting purposes.

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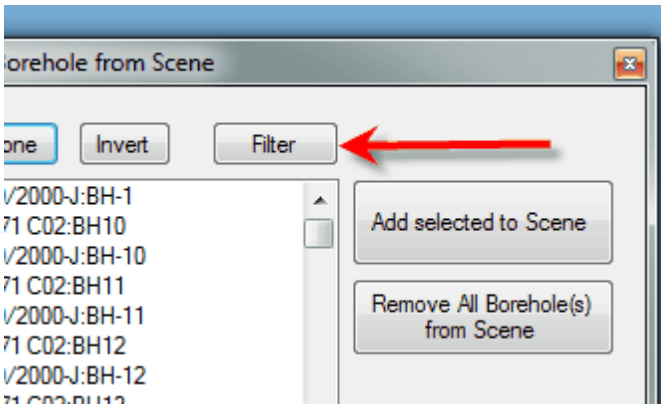
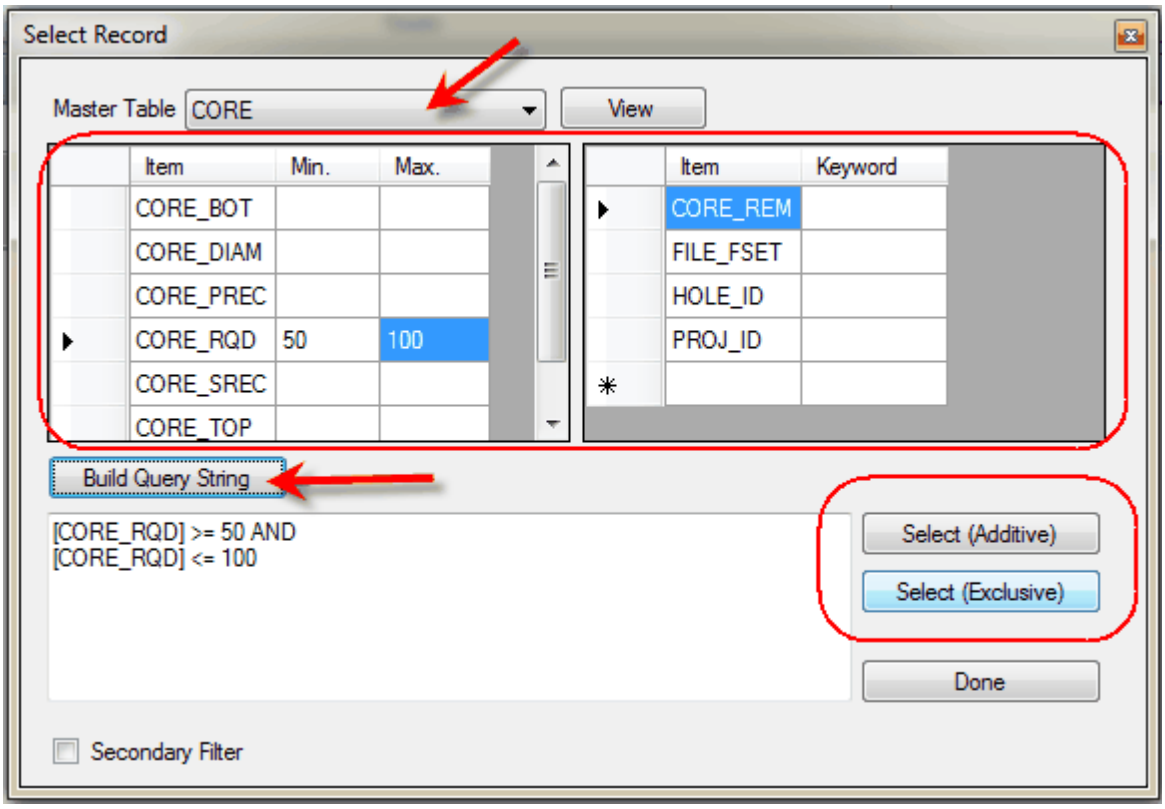
8.3.4 Filtering records

1. To select multiple records that match certain common criteria, click the [Filter] button on the borehole tool box to bring up the Select Record Dialogue.



2. Select the Master Table which the criteria will be built.

3. Key in the criteria for the respective properties. Value type properties are listed on the left input table, and string type properties are listed on the right.



4. Click [Build Query String] to preview the criteria.

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5. The combine the matching records in addition to those already been selected in the calling tool box, click [Select (Additive)].

6. Alternatively, to clear the previous selections in the calling tool box before adding the new matching records, click [Select (Exclusive)].

7. Click [Done] to close the tool box.

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Secondary Filter

In the event multi-level criteria selection is needed,

1. Check "Secondary Filter".

2. Select the Secondary Table for which the criteria will be built upon.

3. Select the respective Field of the Secondary Table which the constraint is imposed on.

4. Specify the constraint value/text in the respective input box.

5. Select and match the respective field pair (one for the lower bound, one for the upper bound) which the ***limiting range values*** could be extracted.

6. Select the field from the Master Table for which the the records will be filtered against the ***limiting range values***.

7. Click [Select (Additive)] or [Select (Exclusive)] to select the records in the calling tool box.

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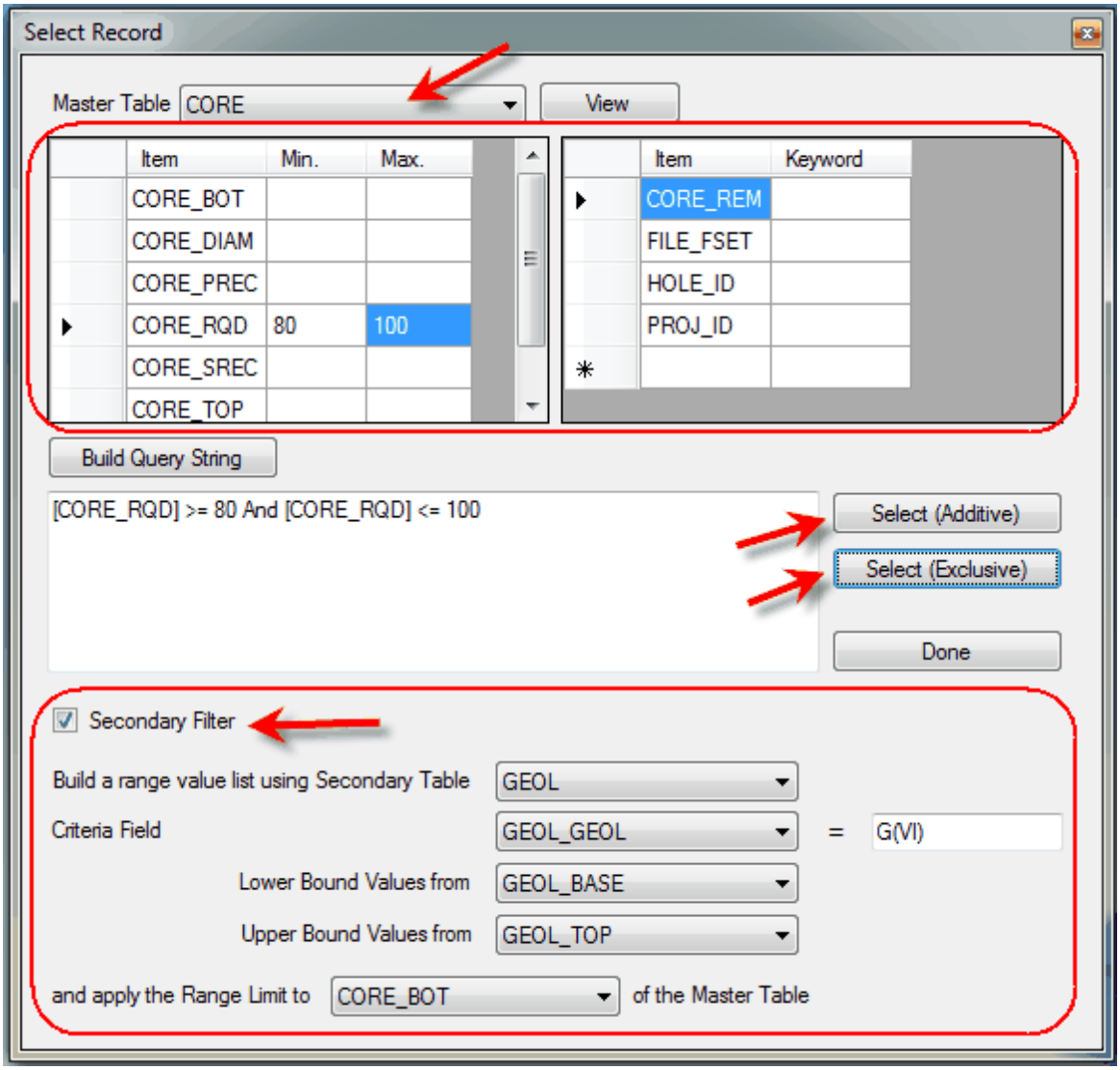
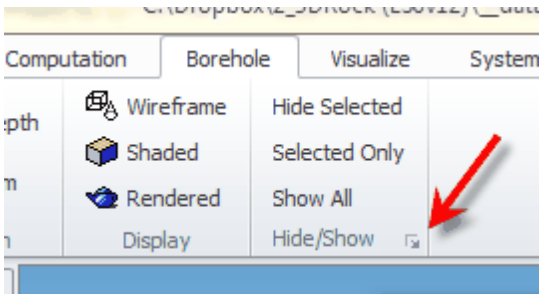


8.3.5 Change display type

To change the display type of the borehole (i.e. visualized based on either GEOL_GEO, GEOL_GEO2, or GEOL_GEO3 code),

1. Click the arrow marker at the lower right corner of the Hide/Show ribbon group.



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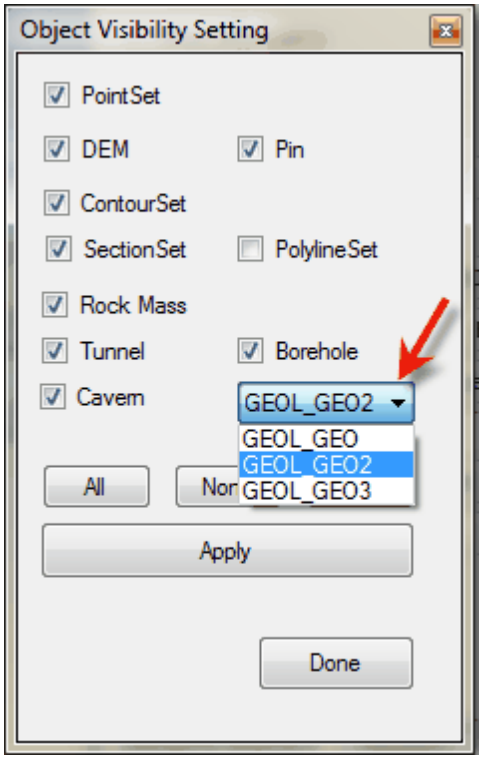
2. Select the type from the drop down list. The visual display of the Borehole in the Scene will be changed with immediate effect.



Note: Should the Borehole GEOL Legend tool box is being displayed, reopen[86] it to update the information.

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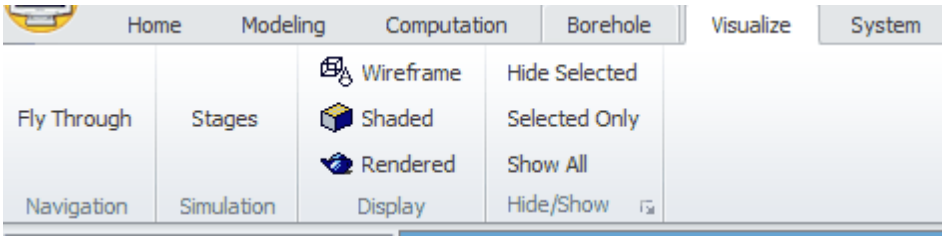
8.4 Visualize



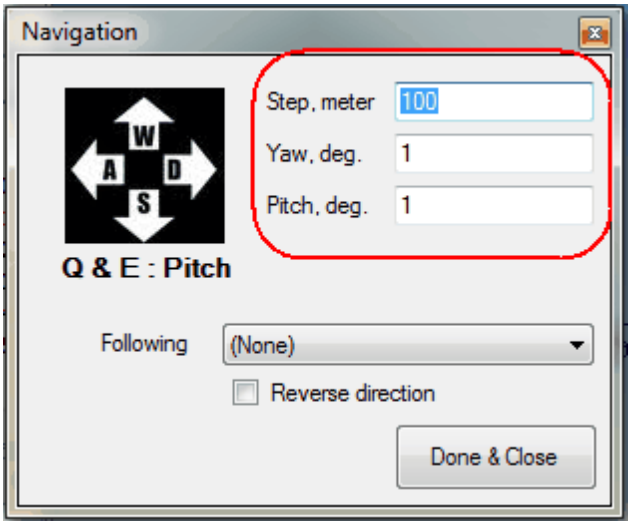
8.4.1 Navigation

8.4.1.1 FlyThrough

To navigate using First-Person view mode,

1. Click Visualize > Navigation > Fly-Through.

2. Change the resolution of moving step and rotation, as necessary.



3. Ensure the Work Space has the focus (by clicking at it), press and hold W, A, S, D, Q and E to move/rotate the *virtual camera* and explore the Scene.

4. Alternatively,
   a) scroll the mouse wheel to move forward/backward,
   b) press and hold right mouse button while moving the mouse to look around, and
   c) press and hold middle mouse button while moving the mouse to pan the *virtual camera*

5. Click [Done & Close] to exit First-Person view mode, and close the tool box.

Traveling on a designated path

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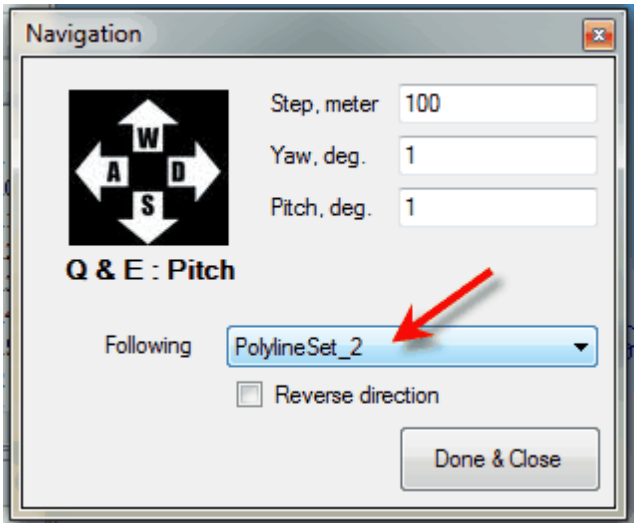
To keep the virtual camera stays on a designated path defined by a polyline,

1. Select the PolylineSet from the drop down list.



2. Make the work space has focus, and navigate using W, S key or middle mouse button scrolling.

8.4.2 Simulation

8.4.2.1 Stages

To create stages to visualize construction/destruction sequences,

1. Click Visualize > Simulation > Stages.

2. Check "Edit Mode".

3. Click [+] at the bottom of Simulation Stages list box. A new <<noname>> entry is added into the list box.

4. Click the new <<noname>> entry.

5. Change its name to "Stage 1" in the text box under "Stage Details". Click [Update] to apply the name change.

6. Make the select stage to exclude (i.e. hiding) all entities by default by checking "Hide all".

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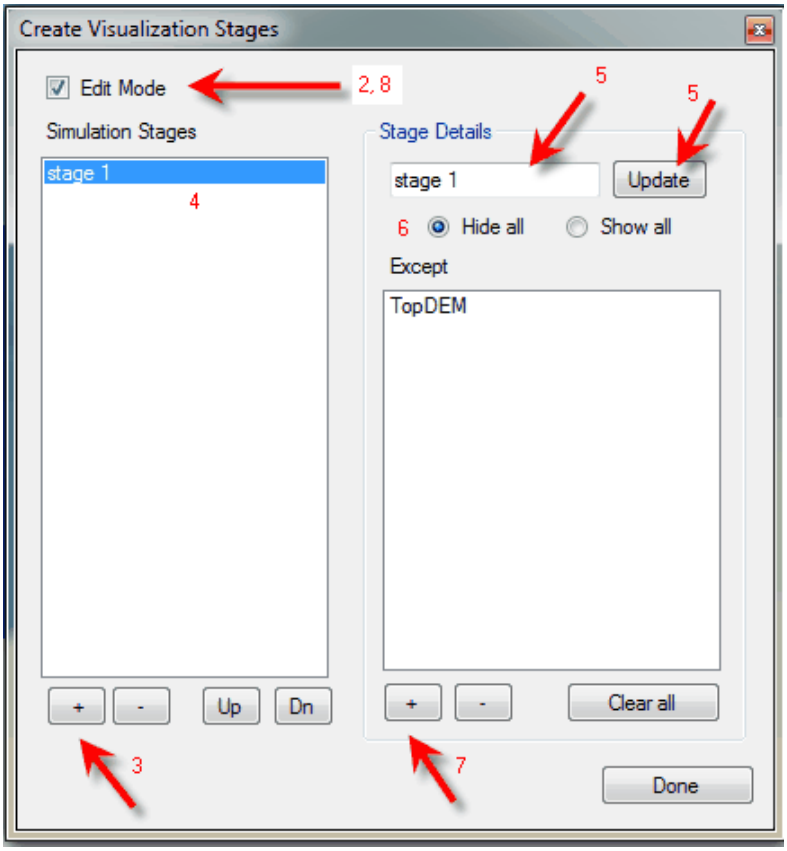
7. Select the entity the be excluded (i.e. to be shown) for this stage by selecting them in the Scene 31, and click [+] button below the Except list box.



8. Uncheck "Edit Mode", and click "Stage 1", you will see only the selected entity in Step 7 is being displayed in the Scene.

9. Repeat Step 3 to Step 7 to create more stages.

10. Click [Done] to close the tool box.

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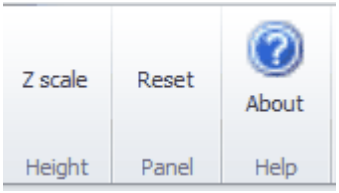
8.5 System

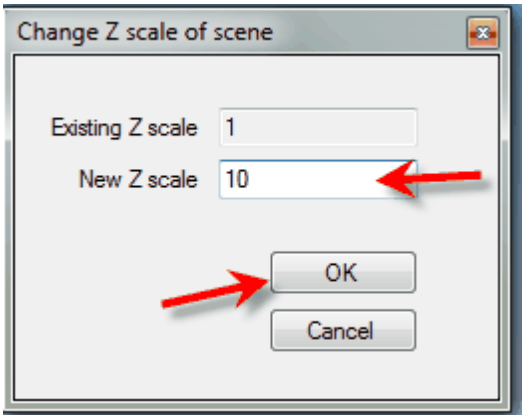


8.5.1 Z scale

To change the vertical visual scale (to exaggerate the profile of DEM, especially),

1. Click System > Height > Z scale.

2. Enter a positive, none-zero integer value in the "New Z scale" text box .



3. Click [OK] to close and tool box and apply it.

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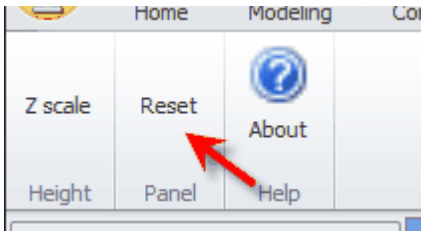
8.5.2 Reset

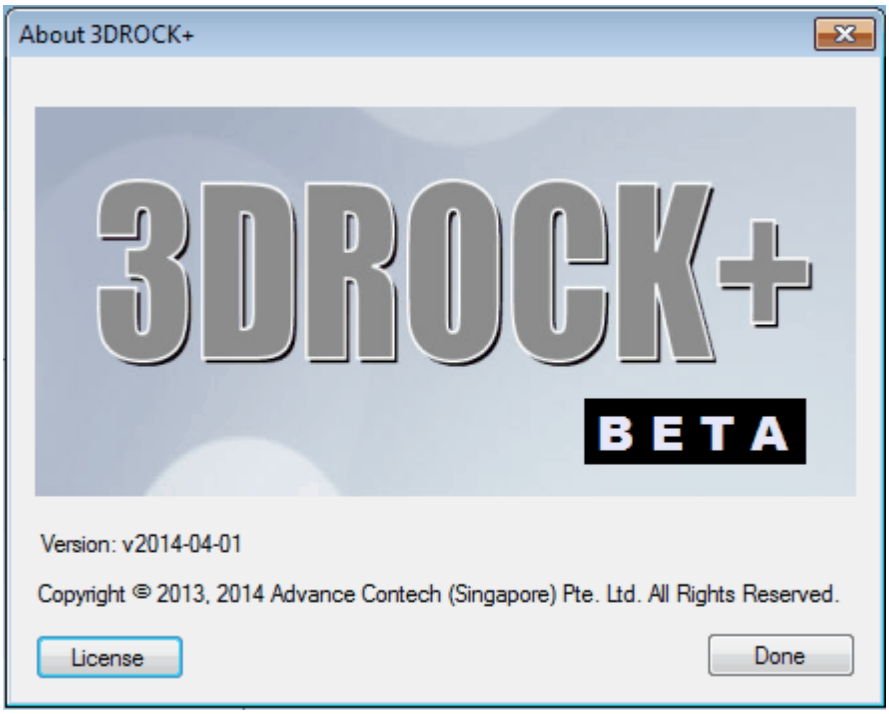
To restore back all the dock panels that were closed,

1. Click System > Panel > Reset.



8.5.3 About

Clicking System > Help > About displays 3DROCK+ version and copyright information.



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Part IX

9 Support & Contact

For technical support, please contact

Advance Contech (Singapore) Pte. Ltd.

Tel	(+65) 6560 6509
Email	info@advance-contech.com
Website	http://www.advance-contech.com

Business hour Monday to Friday, 9 am to 5 pm, exclude public holidays

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